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Manager and Secretary: E. S. MIDDLETON.

OFFICE: 4, LUDGATE HILL, LONDON, E.C.4.

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The Government's Electrical Policy.

ACCORDING to a forecast by the political correspondent of the *Daily Mail*, the Cabinet has decided upon a policy of co-ordination and development of electricity undertakings throughout the country, with a view to arresting the movement of population from country to town by encouraging rural industries, and it is stated that the Government is now developing a comprehensive scheme to that end.

The first step, says the writer, will probably be to increase the power of the Electricity Commissioners, who will then put in hand the standardisation of frequency in all the undertakings south of Glasgow, a work which will take three years and will cost £10,000,000.

The result of this proceeding would be to simplify the manufacture of electrical apparatus, and therefore to lower the cost, besides facilitating co-operation between power stations. It is stated that a conference of supply authorities will be held, to help in devising a practical scheme for transmission lines, and that the Government will probably afford financial assistance in the execution of the works.

In the absence of official details and evidence in support of the foregoing proposals, it is inadvisable to indulge in premature criticism; but whilst we welcome the alleged intention of the Government to take vigorous steps in the direction of electrical development, and to provide funds for the accomplishment of work which, owing to its nature, will not be remunerative for some years to come, we may express the earnest hope that the utmost care will be taken to start work on the right lines.

On comparing the policy outlined above with that enunciated by Mr. Philip Snowden on July 30th, it will be found that the two are in the main identical; moreover, they differ little from that of the Liberal party as set forth in the Lloyd George Committee's report on "Coal and Power." Such extraordinary unanimity, surely unique in Parliamentary history, at once sug-

gests a common origin. It is significant that the personnel of Mr. Lloyd George's Committee, the identity of "the greatest expert on electricity in this country" mentioned by Mr. Snowden, and the composition of Mr. Baldwin's "committee of practical men, who are not politicians," have never been disclosed; our readers may exercise their ingenuity in guessing on this subject if they wish—we have a shrewd idea as to the "leading gentleman," but we shall not help them.

Under the circumstances, what we said in reviewing at some length Mr. Snowden's pronouncement, in our issue of August 8th, applies in the main to the present statements. The situation is changed in that the policy of nationalising electricity supply on the lines of public ownership, adopted by the Labour party, is now shelved; Mr. Baldwin is pledged to encourage individual effort. It may be added that Mr. Snowden did not explicitly advocate the national ownership of electrical undertakings, though he was prepared to provide financial support for the extension of transmission lines. All parties are agreed upon the importance of developing electricity supply in the rural districts, which we look upon as a matter of urgent necessity, and we trust that this will be the first care of the Cabinet in this connection, as it will also, we believe, be the first outlay to prove remunerative and to become effective in promoting the country's welfare.

In this connection we cordially welcome the speech by Mr. P. J. Pybus, M.B.E., in responding for the electrical industry at the annual dinner of the I.E.E. South-Midland Centre last Friday. Whilst advocating an immediate national programme of electrical development, Mr. Pybus laid special stress on the importance of supplying electricity in rural and agricultural areas, and referring to our backwardness in this respect, he drew attention to the maze of transmission lines to be seen in the United States, Canada, Switzerland, and Sweden, carrying electricity to the villages and farms. In Sweden, he said, over 52,000 farms use electricity, and their consumption is 15 per cent. of the country's total output. The farmers of Denmark and Germany are equally fortunate; in the United States no fewer than 164,000 agriculturists use electricity, and seven States have set up Committees to further this development. He remarked also that whilst in this densely-peopled country power is seldom transmitted more than 30 miles, in Sweden over 100 stations—some of them 400 miles apart—are connected by a network covering 30,000 sq. miles; in Ontario 20,000 sq. miles are covered, and in France a network under construction is to deal with 120,000 sq. miles, connecting some stations 800 miles apart. Not the cost of energy, but the lack of mains, is the obstacle to the adoption of electric power in the country.

In proposing the toast above-mentioned, Mr. R. A. Chattock, city electrical engineer, Birmingham, took the opportunity to protest against the proposal to change all 25-cycle to 50-cycle supplies, which he said would involve a colossal cost and do no good to anyone: the money might be better spent on the electrification of railways. He also took exception to the erection of large power stations on the great river estuaries, linked up by trunk mains, holding that it was vastly cheaper to install reserve plant than to link up with distant stations if reliability was the object aimed at, and suggested that smaller stations with efficient plant were preferable. These matters, said Mr. Chattock, should be ventilated and discussed more widely.

If the existence of the three chief frequencies—25, 40, and 50 cycles—can be shown to be very detrimental to progress, we shall reluctantly agree that the change to 50 cycles must be made; certainly all other frequencies should be abolished. But we are disposed to believe that the better plan is to bear the ills we have in that respect, and to bend our energies immediately to the wide extension of electricity supply and the electrification of railways as the most urgent needs.

Our National Problem.

"Conditions of Trade Revival," "The First Need of Industry," "Cheaper Production Needed," "The Future of Industry," "Trade Union Methods," "Cause of Industrial Unrest"—these are the titles of a few of the articles and reports culled from the London newspaper Press toward the end of last week. Ten thousand other cuttings like them have passed through our hands during the last ten years. Those of to-day bear a striking similarity to those of the days gone by, for prophets and advisers can only go on saying the same things again and again. One reason for the revived attention to such matters in the newspapers is the hearing of evidence by the Committee on Industry and Trade. The statements there made necessarily cover the usual very wide ground. They show that the cost of production must be reduced; that industry is trying to bring about such reduction by improvements in methods; that such improvements cost money; that money for industry is hard to get; that where there are no dividends there is greater difficulty in securing new capital; that trade depression causes skilled labour to emigrate; that the cost of production cannot fall materially without a substantial reduction in the cost of living; that high wages and high cost of living are inseparable; that the burden of taxation upon industry is unbearable and must be lifted; that overtime restrictions and other unreasonable trade union impositions form a serious handicap; that there is insufficient sympathy and co-operation between employers and employed; that we must wait for the purchasing power of the world to revive; that certain colonies which have developed manufacturing industries of their own have not helped the Home industrial situation; and, we may add one more, though not one of least importance—that the imposition of import duties should be taken out of the region of party politics and investigated by impartial experts.

The mere recital of a few of the parts of the great problem takes one's breath away. Yet we must not allow ourselves to be overwhelmed. We may find some comfort in the reports that reach us that things really are improving, and we may quote with confidence the statement of Sir Felix Schuster, the banker, that greater stability on the Continent seems to be impending, and that such a change should help our overseas trade; though even this opinion is subject to the reservation that before that stability can arrive the problem of reparations and inter-allied debts requires solution.

Yet "Are we downhearted?" No! Electricity is in our blood. Electrical development is proceeding at a gratifying pace, and that fact inspires us with hope not only for the electrical industry, but for other industries besides. But a vigilant watch over the interests of the British electrical industry is absolutely essential; 'twere folly to think otherwise.

Electrical Progress in Manchester.

In recent issues we have dealt with the progress of electricity supply in London through the agency of a great number of large, medium, and small undertakings. In many respects, however, a record of the progress made in Manchester is of greater moment. The two areas are, of course, not comparable in size, methods of supply, or in many other respects. They have to be studied separately, and few, if any, general inferences can be drawn from them.

While London is of an extremely heterogeneous nature, Manchester is definitely the seat of a number of important industries, and it is now a proved fact that electricity supply is in the nature of a barometer actuated by industry and recording its pressure. The rise of the barometer is not caused by industrial improvements alone; these have important effects upon general trade—a kind of "secondary depression"—which also make themselves felt and add to the pressure.

Statistics show that the sales of energy by the Manchester Corporation Electricity Department during October were considerably higher than in the preceding month or in October, 1923. A comparison of the sales for

the September quarters of 1922, 1923, and the current year shows that the current year's sales exceeded those of both the preceding years both as a whole and for each of four groups which are detailed, *viz.*, engineering, textile, chemical, and "sundry." These groups represent 114 large consumers, who together took over 26 million kWh during the September quarter. The improvement is most marked in the engineering industry (33 firms), which in the September quarter of 1922 required about 7 million kWh, rising to 10 million kWh in 1923, and 11 millions in the current year.

This general industrial improvement is reflected in the growth of consumption for the same quarters in some of the main business centres of the city.

When we consider the distribution of energy among various classes of users in the September, 1924, quarter, the engineering industry claims first place (20 per cent.), traction being the next in importance, and the textile industry third. Lighting and domestic power, in spite of Manchester's advanced position in this respect, represent only about 9 per cent. of the total.

The improvement is shown to have been continued in October, which proved to be a record month in respect of the number of new connections made and applications for supply received. With regard to the former, it is noteworthy that out of 1,720 kW, 1,023 kW represented heating and cooking connections.

It augurs well for the coming winter that during October the Department reached its highest recorded demand—111,380 kW.

South African Trade.

FROM a purely electrical point of view there is not a great deal to be learned from the report of the Senior Trade Commissioner in South Africa, which is reviewed elsewhere in this issue. The position of the electrical trade with the Union was made far clearer by the statistics for 1923, which appeared in our issue of July 11th.

While it is true, as Mr. Wickham states, that the German trade in almost all classes of electrical goods was increased, this was only part of a general increase, and the showing of Great Britain was far better. For instance, in the largest item—mining machinery—while Great Britain's share rose from £351,000 to £407,000, that of Germany increased by only £1,000 to £31,000. In another important section—electrical cable and wire—Germany supplied goods to the value of £8,000, an increase of £2,000. At the same time, however, the United Kingdom's contribution was £162,000 higher at £360,000. The values of imported motors were as follows:—Great Britain, 1922, £45,000; 1923, £122,000. Germany, 1922, £7,000; 1923, £27,000.

The only large section in which Germany made a better showing than this country was "Other electrical machinery"; while our exports fell to the extent of £42,000, those of Germany increased by £3,000.

The British Wireless Exhibition.

THERE was a fundamental difference between the British Wireless Exhibition at the "White City" and the recent Albert Hall show organised by the National Association of Radio Manufacturers, which was a fine display of well-made apparatus. As might have been imagined, the absence of the chief British radio manufacturers had a material effect on the size and quantity of the Shepherd's Bush show, which was almost entirely accommodated in the first gallery off the entrance, and the striking contrast between the two was an excellent demonstration of the futility of persisting in holding two exhibitions of this class each season.

The object of the show at the White City, it was claimed, was to meet the needs of the home constructor of receiving sets, but it was difficult to judge whether the exhibition actually was of any use or not; as it was far from representative, it is questionable whether the aims of its promoters were fulfilled. The exhibits consisted very largely of components and accessories of the smaller and cheaper variety, and of so-called "novelties," the idea being not only to exhibit them, but to sell them on the spot. Well-known manufacturers were in a distinct minority, and, although one or two stand-holders hastily unearthed apparatus some of which might have appealed to the purchaser with a slender purse, the attempt to feature the inexpensiveness of the exhibits appears to be a mistaken policy.

It is admitted readily enough by those who ought to know that radio components, however small a part they may play in assisting the complete set to function, in order to be satisfactory must be thoroughly well made. It is not suggested, of course, that receivers and accessories generally cannot be made less expensive than some of them are at present; however, in any attempt to reduce their cost, a tendency to swing over to the other extreme would be detrimental to all concerned.

The beginner will be well advised to commence with well-tried materials, which can be depended upon to give good results. Failure is not always due to inexperience in manipulation, and disappointment often leads to the casting of reflections which, however just they may be in any particular case, are in no way applicable to the radio industry as a whole.

German Firms and Long Credit.

REPORTS have been prevalent for a long period and in many different markets of the exceedingly favourable credit terms which German firms have been offering to prospective buyers of their goods. The stabilisation of the mark has done little towards diminishing reports of this kind. A recent instance of interest to the electrical trade has occurred in China, the statement being made that a German house was successful in securing a contract through agreeing to accept payment after eight years. It was felt by the local trade that some action should be taken, and representatives of the leading British and American firms engaged in the electrical business in China held a meeting with their German competitors in order to see what could be done towards eliminating such ruinous rivalry. *Capital and Trade* says that all parties present were in sympathy with the scheme, but nobody was able to put forward a proposal acceptable to even one in four of those present. At the same time the paper throws a different light on the actual terms arranged by the German house in accepting the contract in question.

The order was for a 4,800-kW installation for a cement works, the value being $620,000. It appears now that the purchasers agreed with the German electrical firm to accept payment by an issue of bonds for the amount of the contract and bearing 10 per cent. interest, these bonds being guaranteed by the cement works on their plant. The important point is, however, that the German electrical company before accepting these terms ascertained that the Chinese Banking Consortium in Peking would undertake to discount the bonds before they matured. This, of course, puts a different complexion on the story that the German firm would have to wait eight years for its money.

New Cookers for Old.

To learn from our opponents is sound strategy, and a presidential address by Mr. H. Clark to the Midland Junior Gas Association, reprinted in the *Gas World*, should be read by electricity supply managers. It contained constructive criticism of the gas industry, and showed how much mischief resulted from the installation on consumers' premises of defective apparatus, of which he produced a number of examples. Another important point which he raised was the necessity of ensuring that consuming apparatus was kept up to date; thousands of gas cookers had been in use for many years and were not so efficient as they should be. It is a great mistake, when apparatus has been installed in a consumer's house, to let it go at that. Continuous *service* is essential to satisfaction, and the satisfied consumer is the ideal advertisement.

E

Tidal Power Installations.

By J. O. BOVING.

THE very able and interesting article on hydro-compressors in connection with tidal power developments, which appeared in the REVIEW of November 14th, opens a discussion on a subject which may prove to be of immense importance to Great Britain. The potential power to be derived from the tides round the British Isles is of such magnitude that a practical solution would put our country in the front rank of water-power users.

The hydro-compressor problem is being, and has been for the last few years, very seriously examined here, but as yet no publication of results has been made pending conclusive proofs of the commercial usefulness of the system. It is probably correct to say that in no country —at present—have researches in this line been pushed further than here, although it is a fact that up to a few years ago the North American countries and the Continent of Europe were leading.

All the existing installations, some of which have proved successful, although the majority are of doubtful value, have aimed at a relatively high compression, as the air has been used for mining tools.

The researches and tests in this country have, however, established that the plants abroad have been built with a very vague notion of the scientific principles underlying the process of hydraulic compression, hence the indifferent results. Neither the induction of air at the intake nor the separation of air from the water has been properly understood; thus the arrangement may have been fairly successful in one case, and quite the reverse in a number of apparently similar designs.

All this has been carefully examined here, and proper information has been co-ordinated for the various parts of the plant. It has also been found that the laws governing high and low pressures are different, and probably this is the reason why hydro-compressors have not so far been commercially used for low-head power developments.

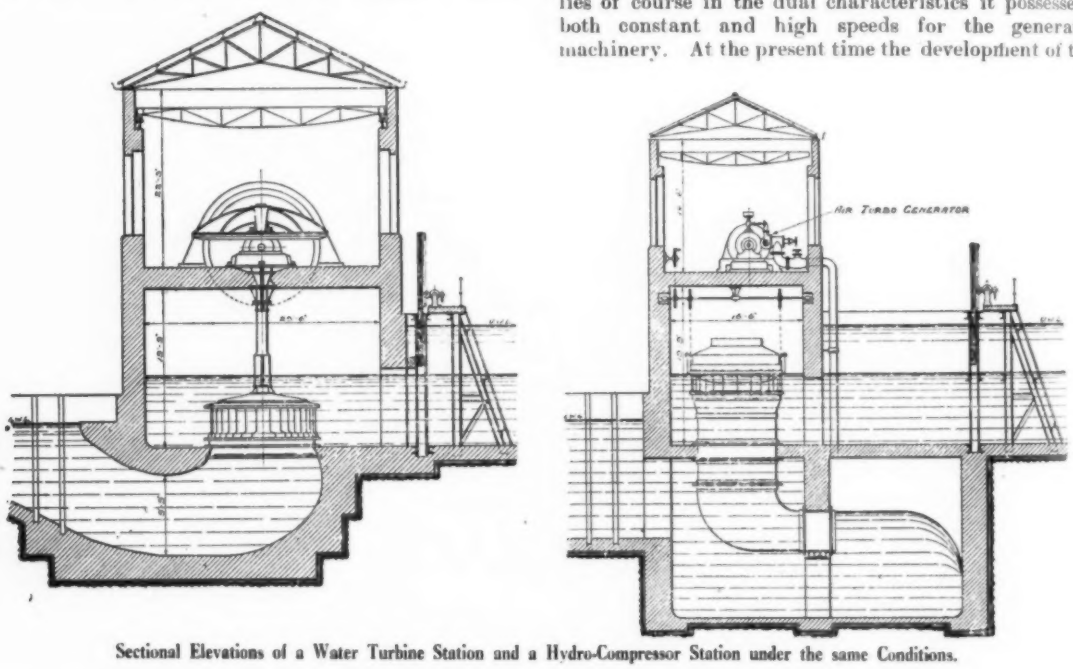
It is—or has been—difficult to induce air and to separate it when dealing with large bodies of water such as would be used in tidal developments, and it is especially in this direction that the investigations in this country have been carried on. The results, so far, are satisfactory, and a commercial efficiency of above 80 per cent. has been reached. The existing plants in North America and the Continent have given from 40 per cent. to 70 per cent. commercially. In some instances it has been claimed that 80 per cent. or more has been attained, but on closer investigation this has not been found to be correct for actual working conditions.

When the hydro-compressor is used for a variable head —as for tides—other complications are introduced which are not immediately apparent, but have required a great deal of research work to overcome them.

The capacity for storing energy during the dead periods is negligible with such a medium as low-pressure air. Even the immense cavities which could be arranged in a hollow dam do not hold a large reserve, and it is therefore necessary to design the power plant to work even with the smallest head. It is especially in this direction that the hydro-compressor scores heavily over the water turbine, which at synchronous speed only begins to develop power at a considerable difference in levels.

The chief advantage, though not the only one, of the hydro-compressor system for tidal power development lies of course in the dual characteristics it possesses of both constant and high speeds for the generating machinery. At the present time the development of tidal power is invariably linked with the other interests of the particular estuary considered—principally shipping facilities. These other interests may exert a controlling influence on the system to be adopted. The constant-level inner-basin system, wherein the estuary within the dam has only a small range, in the neighbourhood of, say, two or three feet, is worthy of consideration, forming as it does a constant-level dock ideal for shipping. In this case particularly low operating heads are met with, and the hydro-compressor may prove most valuable.

American and Continental experience of the hydro-compressor has been, as previously stated, connected with high air pressures. Moreover, the practical installations have also had the benefit of high working heads—the very lowest being as great as 19 ft. Whether it would work satisfactorily and economically under the greatly reduced head and variable head met with in tidal power work was at first a matter of grave doubt to the investigator. The time is not yet to give a



Sectional Elevations of a Water Turbine Station and a Hydro-Compressor Station under the same Conditions.

dogmatic answer on the point, in fact it has been found by actual test that plants designed with as little scientific backing as the existing ones would be neither efficient nor economic. But investigators have now come to a point where certain radical amendments in design are in process of proof, and they look forward with confidence to a solution which will provide such a plant.

Anticipating the completion of the satisfactory low-variable-head hydro-compressor, we may indulge in a little appreciation of its value. The drawing on p. 844 shows a low-head river installation, comparing water turbines with a hydro-compressor driving air turbines. The conditions are a fall of 5.7 ft., and an output of 400 h.p.

It will be seen that the water turbine station involves turbine rotors of 12 ft. diameter, which run at a speed of only 25 r.p.m., driving through cumbersome bevel gearing low-speed generators, even then at only 125 r.p.m. The electrical engineer will immediately note the disadvantages of this arrangement in comparison—both as to first cost, operating and maintenance cost, and also reliability. The air turbo-generator runs at 3,000 r.p.m., and the set weighs and costs a fraction of the water-driven set. Moving parts are light and in the dry. The corrosion of the turbine runner—much worse in sea water than in fresh—and the trouble of heavy running vertical parts are both eliminated. The proposition as far as machinery goes is in a different category altogether.

In addition, whether the system be variable head or constant the air turbo-generator runs not only at steam turbo speeds, but at a fixed speed. The electrical equipment may therefore be in line with standard practice. Yet another point of value is the greater ease of close speed governing and the elimination of the complicated and often unsatisfactory water turbine governor.

Tests of the low-head hydro-compressor prove that this hitherto unexplored apparatus possesses a singular overload capacity. By sacrificing a small percentage of efficiency it is found that the output may be more than doubled, and it will thus be seen that this will have an important bearing on its use for the variable-head system. It will enable full load to be generated, say to meet a peak load, even when the working head has been reduced to half its full-load value. A water turbine is, of course, incapable of such an overload; as a result the power output would fall with—and almost as fast as—the head. The provision of excess turbines on the water system would be prohibitive. The lower cost of air turbines and their own greater overload capacity would enable full power to be obtained with the lowest heads.

Transmission of power by compressed air proves an efficient means, provided the distance is reasonably short and the pressure high. At the pressure of, say, 15 lb. per sq. in. the distance is rather limited. For example, a 22-in. pipe would transmit 1,000 h.p. a distance of 1,000 ft., with an energy loss of 10 per cent. Even for short distances transmission will be valuable. A steam auxiliary station will usually appear here, as in fresh-water low-head developments. Generally this will be some little distance from the tidal power dam, to suit fuel facilities, &c. However, the air machinery may be situated within the confines of the fuel-driven station.

The preheating of the air as a help to meet increased outputs has rightly been given mention on previous occasions, and it should be noted that this is a highly efficient method of conserving the energy of fuel, as well as being of great simplicity. Also, during times of no tidal output, there will be no doubt that the air turbines may be utilised as low-pressure steam turbines, in cases where the auxiliary steam station is used.

Recent researches in this hitherto neglected system have convincingly indicated very original but sound developments.

The work of modifying and improving the hydro-compressor so far points to a successful conclusion, not only with regard to technical efficiency, but also commercial efficiency, in which respect the older designs were hopelessly out.

The technical discussion following the publication of these results will, we believe, lead to the adoption of this attractive system in many cases.

The Dielectric Strength of High-Pressure Transformer and Switch Oils.

By H. D. JUKES.

In the past, and now, a great deal of energy, time, and money has been wasted in the endeavour to obtain a high dielectric strength in transformer and switch oils through the adoption of a wrong method of treatment. Most prevalent among the wasteful methods have been:—

(*a*) Evaporating the free and dissolved moisture from the oil by heat methods, such as steam coils, steam-jacketed pans, and electrical elements, which although more or less attaining their objective, have in the greater number of cases contaminated the oil, inasmuch as the heat has been excessive and has charred or burned the oil; this, in the case of the present-day white or half-white non-sludging transformer oils, changes their colour to light amber, and seriously affects the dielectric strength, as this charring has a tendency to leave small flakes of floating carbon in the oil.

(*b*) The filter press, which was a big improvement on the heat treatment, did not do away with the original trouble—free moisture—as, in the case of an oil holding free moisture, once the filter papers became impregnated with the moisture, no oil could be forced through them without first of all forcing the moisture through the papers into the dried oil. Firms dealing extensively in transformer oil were satisfied first of all to allow any oil which they had to treat to settle in storage tanks, then drain the free moisture away, and allow the filter then to take out the dissolved moisture, and any suspended articles which the oil might contain; this proved to be a very expensive process, as the paper was very costly, and once it was impregnated with water from the bulk oil, the press had to be stopped and all the papers changed, and the pipes, plates and frame completely dried before new papers could be inserted, the papers themselves having been already dried in an oven. If no free moisture was met with during the treatment of the oil, the dissolved moisture made it necessary to change one paper in each section every five barrels, in order to obtain a reasonable amount of efficiency.

I, personally, was responsible for the treatment of many thousands of gallons of transformer oil per month under the two methods mentioned above, and was willing to welcome with open arms any method whatever which could be evolved in order to curtail the amount of expense and anxiety which one always endured with either method of treatment. In 1919 the centrifugal separator was brought to my notice, and I then started investigations and made tests with a small portable De Laval set supplied by Messrs. Chadburn's (Ship) Telegraph Co., Ltd., of Liverpool. This machine at that time did not do all that was required of it, the weak point being its very small output. However, Messrs. Chadburn were far-sighted

enough to see the great possibilities of such a machine, could it be perfected, and have now to the best of my belief a machine which does the work far more quickly and efficiently than any other method previously in use. I have just had the pleasure of testing a De Laval Chadburn centrifugal machine, Type 700, with a 12-in. diameter bowl, capacity approximately 600 gallons per hour, at 6,000 revs. per minute. While the makers only guaranteed 600 gallons an hour, the machine was capable of producing a much greater output. The test which I gave this machine extended over six months, and was conducted as follows:—

The machine was set up in the works on a solid concrete foundation, and connected direct to a 10,000-gallon tank of white non-sludging transformer oil, which had a viscosity of 225 Redwood seconds at 70 deg. F. The pump attached to the machine was capable of dealing with 600 gallons an hour, and the first test was made by allowing the pump to draw direct from the storage tank, which was outside on the south side of the building, exposed to the weather. After the oil had passed through the machine it went direct into a galvanised tank of 800 gallons' capacity, which was placed in close proximity to the machine. This tank had an outlet whereby barrels could be filled. Before commencing the test I had 250 galvanised barrels of 40 gallons' capacity cleaned and dried, as my object was to treat 10,000 gallons at different speeds of output, putting it into barrels and testing for dielectric strength after a reasonable amount of time had elapsed in order to allow any free moisture which might still remain in the oil to settle to the bottom of the barrels. In reading this report on the different tests, it is advisable to follow the weather report, as weather conditions seriously affect dielectric strength where one is not working in a building which is heated. These tests were run in a building having no artificial heating and where practically atmospheric conditions were met with.

Test No. 1.—Cloudy weather, slight rainfall.—The output of the machine was regulated to 60 gallons per hour, and a sample of the oil before being put through the machine was taken, as well as another sample immediately after it had been through the machine; also 10 barrels were each sampled after eight hours of continuous running, the outlet feeding into the 800-gallon tank and the barrels being filled from this tank. The respective dielectric strengths under standard methods (0.15-in. gap, ½-in. ball electrodes) were as follows:—

Output 60 gallons an hour.

	Dielectric strength.
Bulk oil from storage tank ...	2,000 volts.
Bulk oil from delivery spout of centrifugal machine	over 50,000 volts.

Samples from barrels after standing for 24 hours:—

	Dielectric strength.		Dielectric strength.
No. 1 ...	48,000 volts.	No. 6 ...	49,000 volts.
No. 2 ...	48,000 ,,	No. 7 ...	48,000 ,,
No. 3 ...	49,000 ,,	No. 8 ...	48,000 ,,
No. 4 ...	48,000 ,,	No. 9 ...	47,000 ,,
No. 5 ...	47,000 ,,	No. 10 ...	46,000 ,,

The temperature of the oil was normal, no heat having been employed to lighten the viscosity. The same method was employed the next day and the following days, only the output of the machine was increased each day.

Test No. 2.—Very wet and cold.—The output of the machine was increased to 120 gallons an hour, using the same oil from the same tank.

	Dielectric strength.
Bulk oil from storage tank ...	2,000 volts.
Bulk oil from delivery spout of centrifugal machine	over 50,000 volts.

Samples from barrels after standing for 24 hours:—

	Dielectric strength.		Dielectric strength.
No. 1 ...	46,000 volts.	No. 6 ...	48,000 volts.
No. 2 ...	44,000 ,,	No. 7 ...	46,000 ,,
No. 3 ...	48,000 ,,	No. 8 ...	46,000 ,,
No. 4 ...	48,000 ,,	No. 9 ...	47,000 ,,
No. 5 ...	49,000 ,,	No. 10 ...	47,000 ,,

Test No. 3.—Fair, but cloudy.—The output of the oil was increased to 240 gallons an hour, using the same oil from the same tank.

	Dielectric strength.
Bulk oil from storage tank ...	2,000 volts.
Bulk oil from delivery spout of centrifugal machine	over 50,000 volts.

Samples from barrels after standing for 24 hours:—

	Dielectric strength.		Dielectric strength.
No. 1 ...	47,000 volts.	No. 6 ...	45,000 volts.
No. 2 ...	47,000 ,,	No. 7 ...	45,000 ,,
No. 3 ...	48,000 ,,	No. 8 ...	49,000 ,,
No. 4 ...	49,000 ,,	No. 9 ...	49,000 ,,
No. 5 ...	48,000 ,,	No. 10 ...	48,000 ,,

Test No. 4.—Fair, but cloudy.—The output of the oil was increased to 480 gallons per hour, using the same oil from the same tank.

	Dielectric strength.
Bulk oil from storage tank ...	2,000 volts.
Bulk oil from delivery spout of centrifugal machine	over 50,000 volts.

Samples from barrels after standing for 24 hours:—

	Dielectric strength.		Dielectric strength.
No. 1 ...	48,000 volts.	No. 6 ...	46,000 volts.
No. 2 ...	49,000 ,,	No. 7 ...	48,000 ,,
No. 3 ...	47,000 ,,	No. 8 ...	48,000 ,,
No. 4 ...	48,000 ,,	No. 9 ...	47,000 ,,
No. 5 ...	46,000 ,,	No. 10 ...	48,000 ,,

Test No. 5.—Fine, warm sunshine.—The output of the oil was increased to 580 gallons per hour, using the same oil from the same tank.

	Dielectric strength.
Bulk oil from storage tank ...	2,000 volts.
Bulk oil from delivery spout of centrifugal machine	over 50,000 volts.

Samples from barrels after standing for 24 hours:—

	Dielectric strength.		Dielectric strength.
No. 1 ...	48,000 volts.	No. 6 ...	47,000 volts.
No. 2 ...	48,000 ,,	No. 7 ...	49,000 ,,
No. 3 ...	48,000 ,,	No. 8 ...	47,000 ,,
No. 4 ...	48,000 ,,	No. 9 ...	47,000 ,,
No. 5 ...	48,000 ,,	No. 10 ...	46,000 ,,

At this stage in the test I had to cease operations, as the delivery pump on the machine would not give any greater capacity. The machine was then set to work on general treatment and worked to my entire satisfaction for approximately six weeks, when the makers made for me a pump capable of dealing with about 1,000 gallons an hour. This pump was duly fitted, and tests commenced, still on the upward trend, in an effort to ascertain what the capacity of the machine was, and to what extent, if any, increased output affected the dielectric strength.

Test No. 6.—Cloudy and slight rain.—The output of the oil was increased to 650 gallons an hour, using the same oil from the same tank.

	Dielectric strength.
Bulk oil from storage tank	2,000 volts.
Bulk oil from delivery spout of centrifugal machine	50,000 volts.

Samples from barrels after standing for 24 hours:—

	Dielectric strength.		Dielectric strength.
No. 1 ...	48,000 volts.	No. 6 ...	49,000 volts.
No. 2 ...	47,000 ,,	No. 7 ...	47,000 ,,
No. 3 ...	47,000 ,,	No. 8 ...	48,000 ,,
No. 4 ...	46,000 ,,	No. 9 ...	46,000 ,,
No. 5 ...	46,000 ,,	No. 10 ...	48,000 ,,

Test No. 7.—Very wet.—The output of the oil was increased to 700 gallons an hour, using the same oil from the same tank.

	Dielectric strength.
Bulk oil from storage tank	2,000 volts.
Bulk oil from delivery spout of centrifugal machine	48,000 volts.

Samples from barrels after standing for 24 hours:—

	Dielectric strength.		Dielectric strength.
No. 1 ...	44,000 volts.	No. 6 ...	46,000 volts.
No. 2 ...	42,000 ,,	No. 7 ...	46,000 ,,
No. 3 ...	46,000 ,,	No. 8 ...	43,000 ,,
No. 4 ...	45,000 ,,	No. 9 ...	42,000 ,,
No. 5 ...	47,000 ,,	No. 10 ...	44,000 ,,

Test No. 8.—Very fair, warm sunshine.—The output of the oil was increased to 750 gallons an hour, using the same oil from the same tank.

	Dielectric strength.
Bulk oil from storage tank	2,000 volts.
Bulk oil from delivery spout of centrifugal machine	45,000 volts.

Samples from barrels after standing for 24 hours:—

	Dielectric strength.		Dielectric strength.
No. 1 ...	46,000 volts.	No. 6 ...	42,000 volts.
No. 2 ...	44,000 ,,	No. 7 ...	42,000 ,,
No. 3 ...	38,000 ,,	No. 8 ...	39,000 ,,
No. 4 ...	44,000 ,,	No. 9 ...	39,000 ,,
No. 5 ...	37,000 ,,	No. 10 ...	43,000 ,,

Test No. 9.—Fair and warm.—The oil was increased to 800 gallons an hour, using the same oil from the same tank.

	Dielectric strength.
Bulk oil from storage tank	2,000 volts.
Bulk oil from delivery spout of centrifugal machine	47,000 volts.

Samples from barrels after standing for 24 hours:—

	Dielectric strength.		Dielectric strength.
No. 1 ...	38,000 volts.	No. 6 ...	40,000 volts.
No. 2 ...	38,000 ,,	No. 7 ...	42,000 ,,
No. 3 ...	38,000 ,,	No. 8 ...	37,000 ,,
No. 4 ...	38,000 ,,	No. 9 ...	39,000 ,,
No. 5 ...	38,000 ,,	No. 10 ...	41,000 ,,

The next test was to endeavour to ascertain whether oil treated by the centrifugal method would retain its dielectric strength if held in any ordinary tank subject to the atmospheric conditions of a works which was not heated in any way. The oil was drawn and dealt with by the machine, but was allowed to rest in the tank in the building. The periods of output and results of test were as follows:—

Test No. 10.—Weather fair and warm.—The output of the machine was 400 gallons per hour, bulk from storage tank.

	Dielectric strength.
Bulk oil from storage tank ...	2,000 volts.
Bulk oil from delivery spout of centrifugal machine	over 50,000 volts.
Tank was then allowed to become full, when sample was taken which gave a dielectric strength of	48,000 volts.
Tank was covered and allowed to stand for 12 hours, when dielectric strength of samples drawn from the bottom of the tank through the outlet pipe was	43,000 volts.

The oil was then drawn off into dry barrels, which stood for 14 days and were then tested, and the barrels gave the following results:—

	Dielectric strength.		Dielectric strength.
No. 1 ...	38,000 volts.	No. 9 ...	41,000 volts.
No. 2 ...	38,000 ,,	No. 10 ...	40,000 ,,
No. 3 ...	38,000 ,,	No. 11 ...	43,000 ,,
No. 4 ...	38,000 ,,	No. 12 ...	38,000 ,,
No. 5 ...	38,000 ,,	No. 13 ...	37,000 ,,
No. 6 ...	37,000 ,,	No. 14 ...	41,000 ,,
No. 7 ...	35,000 ,,	No. 15 ...	40,000 ,,
No. 8 ...	40,000 ,,	No. 16 ...	39,000 ,,

Test No. 13.—Dull and raining.—Output, 500 gallons an hour.

	Dielectric strength.
Bulk oil from storage tank, preliminary sparking immediately, broke down	2,000 volts.
Bulk oil from delivery spout of centrifugal machine	over 50,000 volts.
Tank was allowed to become full, when sample was taken which gave a dielectric strength of ...	45,000 volts.
Tank was covered and allowed to stand from Saturday noon until Monday morning, when dielectric strength of sample drawn from the bottom of the tank through the outlet pipe was	38,000 volts.

The oil was then drawn off into dry barrels and stood for 14 days, and then tested, and the barrels gave the following results; when tested, the weather was warm, with bright sunshine:—

	Dielectric strength.		Dielectric strength.
No. 1 ...	40,000 volts.	No. 9 ...	35,000 volts.
No. 2 ...	42,000 ,,	No. 10 ...	35,000 ,,
No. 3 ...	37,000 ,,	No. 11 ...	37,000 ,,
No. 4 ...	38,000 ,,	No. 12 ...	37,000 ,,
No. 5 ...	40,000 ,,	No. 13 ...	37,000 ,,
No. 6 ...	39,000 ,,	No. 14 ...	37,000 ,,
No. 7 ...	33,000 ,,	No. 15 ...	38,000 ,,
No. 8 ...	40,000 ,,	No. 16 ...	37,000 ,,

Although the bulk oil samples from the tank only had a dielectric strength of 38,000 volts before being put in barrels after having stood over the week-end, which was wet on Saturday, but dry and warm on Sunday and Monday, while being barelled, the actual samples from the barrels drawn 14 days later gave the above results; atmospheric conditions seem to have upset the tests in so far as the dielectric strength had increased.

Test No. 14.—Dry and sunny.—Output, 600 gallons per hour.

	Dielectric strength.
Bulk oil from storage tank ...	2,000 volts.
Bulk oil from delivery spout of centrifugal machine	over 50,000 volts.
The tank was then allowed to become full, when sample was taken, which gave a dielectric strength of	48,000 volts.
Tank was covered and allowed to stand from Saturday noon until Monday morning, when dielectric strength of samples drawn from the bottom of the tank through the outlet pipe was	46,000 volts.

The oil was then drawn off into dry barrels and stood for 14 days, and then tested, and the barrels gave the following results; when tested, the weather was warm, bright sunshine prevailing:—

	Dielectric strength.		Dielectric strength.
No. 1 ...	44,000 volts.	No. 9 ...	46,000 volts.
No. 2 ...	46,000 ,,	No. 10 ...	46,000 ,,
No. 3 ...	43,000 ,,	No. 11 ...	42,000 ,,
No. 4 ...	44,000 ,,	No. 12 ...	39,000 ,,
No. 5 ...	43,000 ,,	No. 13 ...	44,000 ,,
No. 6 ...	45,000 ,,	No. 14 ...	44,000 ,,
No. 7 ...	45,000 ,,	No. 15 ...	44,000 ,,
No. 8 ...	45,000 ,,	No. 16 ...	46,000 ,,

The machine throughout the test worked continuously for approximately six months, and required no attention except the usual cleaning at noon and at night. No mechanical stoppages were necessary, and during the test the machine actually treated about 300,000 gallons.

I would mention that another great advantage which this method of treatment has over other methods is that the machine itself is so compact that it can be tucked away in any corner of the works, and the floor space actually occupied is negligible.

Magnetisation Made Audible.—In the research laboratory of the General Electric Company of America apparatus has been made whereby a magnet, when brought near a piece of iron, causes a roaring noise to issue from a loud speaker. A piece of soft iron is inserted in a coil of 17,000 turns of three-mil wire. The coil is attached to an amplification set, which in turn is connected either to head 'phones or to a loud speaker. When a magnet is brought near the iron, a rustle is heard. If the approach is rapid, the noise is loud and abrupt; if slow, the sound is softer and lasts longer. While the magnet is being removed, a similar sound is heard. If the magnet is quickly removed and quickly brought back to its former position, only a little sound is heard. If it is brought still nearer the iron, there is more sound. If, after the magnet has been brought near the iron bar and the noise has subsided, the poles of the magnet are reversed, a very loud and abrupt noise is heard.

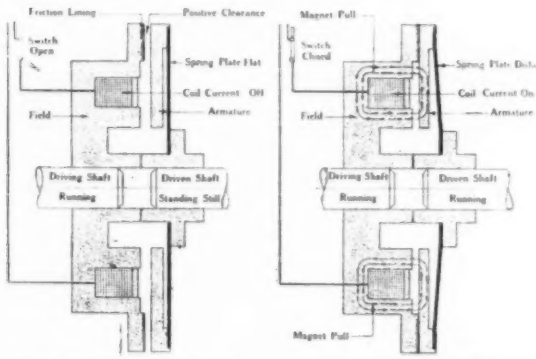
It is suggested that the phenomenon results from the motion of the unit magnetic particles within the iron. Thus, when the magnet is brought near the iron, groups of the atoms turn round to face in the same direction. The stronger the magnetic influence the larger the number of particles that turn round, the greater the effect, and the louder the noise. Similarly, when the magnet is removed, the atoms gradually become disarranged. When the magnet is quickly brought back to its original position, the noise is slight since only a few of the particles have become disarranged. When the polarity of the magnet is reversed the particles turn round quickly, and thus the noise is much louder.

Smoke and Its Prevention.—A Chadwick Public Lecture on "Smoke: Its Cause, Nature, Effects and Methods of Prevention," was given by Prof. J. B. Cohen, F.R.S., on November 19th. The lecturer explained smoke as the concomitant of insufficiency of air or too low a temperature in combustion and spoke of its effects upon animal and plant life. He said that a strict enforcement of the Public Health Act, 1875, would stop the great bulk of factory smoke, but it would leave domestic smoke untouched. Gas and electricity were coming more and more into prominence for cooking and heating, which was a good sign. Cheaper gas, cheaper coke, cheaper electricity and an energetic local authority encouraging their sale, while holding a firm hand upon the offending boiler chimney, would clear the air of most of the smoke.

Magnetic Clutches.

By C. H. S. TUPHOLME.

THE main use of a dielectric clutch is for connecting and disconnecting machinery from its source of power, the friction surfaces of the clutch being held together by the direct pull of an electric magnet. When the circuit through the electromagnet is closed, the clutch is engaged; when it is open the clutch is disengaged. One member of the clutch contains the coil which, when energised by an electric current, pulls the other member into contact with it, the contact being made on a friction surface which is carried by a flange on the outside of the first member. As long as the electromagnet is energised, the two members rotate as a unit, and



Clutch disengaged; spring plate flat. Clutch engaged; spring plate dished.

Fig. 1.—Sections of Magnetic Clutch.

when no current is flowing through the coil, the two members stand a short distance apart and a positive running clearance is provided. Magnetic clutches have been available for upwards of twenty years; they are used in most industries, and are built from 6 in. diameter to 78 in. to transmit anything from 1 up to about 2,000 h.p.

Magnetic clutches possess a number of distinct advantages over other types. For instance, the direct magnetic action results in a simple compact structure with no toggles, levers, and other parts to wear or get out of order. It is only necessary to open or close a switch to disengage or engage the clutch, and the switch may be placed at any convenient distance from the clutch, and may be operated either manually or automatically. Smooth acceleration results from the fact that in the short interval of time necessary for the magnetic pull to attain its full strength, the friction surfaces engage gradually, there being sufficient slip to secure a smooth start. For each size of clutch there is a fixed capacity depending upon the known pull of the magnet, and the clutch is not adjusted so that it will lock. The clutch capacity is not affected by centrifugal force, so that these units may be operated at high speeds.

In order to engage or disengage a magnetic clutch it is only necessary to turn the electric current on or off, the operation being as simple as switching the light on or off. It is obvious that where a clutch must be operated frequently, this feature is of great value, since in other forms of clutch considerable effort is often necessary to effect engagement. The magnetic clutch may be operated from any one of several points. The clutch may be mounted high up near the ceiling, or underneath or behind some machine, while the control switch may be placed at any point convenient to the operator. In other cases the clutch may be engaged and disengaged automatically by means of any of the usual forms of floor switches and pressure regulators.

When current is first sent through an electromagnet, the magnetic pull does not attain its full value immediately. An appreciable time interval passes before this pull becomes effective, and it is for this reason that a magnetic clutch will not "grab" the load, but will build up the pressure between the two members gradually and start the load smoothly. This smooth acceleration of the load is of course entirely automatic and independent of the operator. The actual time of engagement varies from a fraction of a second on small clutches to several seconds on the largest types.

It is quite apparent from a study of the clutch design that the pressure between the members is balanced within the clutch itself, and there is an entire absence of thrust on the shaft mounting the clutch. In addition, there is no possibility that the clutch will become worn in such a way that it will engage one shaft eccentrically to the other with a resulting side thrust.

The electromagnet for each size of clutch exerts a definite number of pounds pull, which creates a definite pressure between the friction surfaces, and the horsepower which the clutch will transmit at any particular speed is a fixed quantity. It is not possible to manipulate a magnetic clutch in such a way that it will lock or start with a jolt; as long as the load conditions for which it was designed remain the same, the magnetic clutch will always retain its characteristic smooth starting feature.

In place of the usual sliding members which are used on other types of clutches to secure the engagement and disengagement of the friction surfaces, one of the two members in the best types of clutch is mounted on a spring plate in the form of a circular steel disk. When the magnet is energised and the two parts of the clutch are drawn together, this plate becomes slightly dished, and when the clutch is de-energised, the plate springs back flat again and draws the two members apart (fig. 1). With this type of construction, there is no relative move-

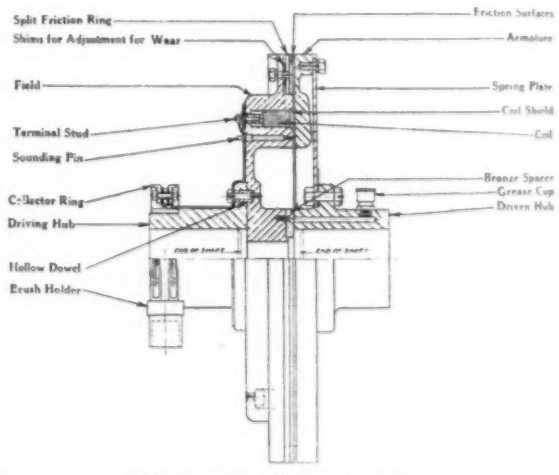


Fig. 2.—Details of Magnetic Clutch.

ment between any of the clutch points, and none of the wear or necessity for lubrication which would exist if a sliding key were used.

The clutch is so designed that the member which contains the magnet coil may be removed without disturbing either the driving or the driven shaft. This is accomplished by removing the bolts and hollow dowels which hold the member to the driving shaft, when the entire member can be lifted out (see fig. 2).

For the friction element a flat circular ring of asbestos material is mounted on the outer periphery of the clutch member which contains the magnet coil. The friction lining is mounted on a separate cast-iron ring which is split in order to facilitate removal. This cast-iron ring is placed on the flange outside the field coil so that the

driving force is applied at the point of greatest radius, and any heat generated by friction is outside and away from the magnet coil. As the friction lining wears down, cap screws which hold the cast-iron ring to the clutch member may be loosened, and thin sheet iron shims inserted between the flange and the ring in order to move the lining out from the surface of the flange. If it is necessary to put in a new friction lining, the cap screws can be removed and the two halves of the friction ring drawn out from between the clutch members.

In the leading types of clutch the magnet coil is thoroughly protected against moisture, being wound, taped and then immersed in a heated impregnating tank. All moisture is removed under vacuum, and an impregnating compound is forced into the coil under heavy pressure. The coil is then placed in position in the clutch member, and melted compound is poured round it so that the finished construction is moisture-proof.

The accompanying table will give some idea of the ratings of these clutches and the work they are capable of performing. These ratings are in terms of ultimate h.p. per 100 r.p.m. and in pull-out torque. H.p. per 100 r.p.m. indicates the horse-power which the clutch is capable of transmitting at a speed of 100 r.p.m. At twice this speed the clutch will transmit twice as much horse-power. For a given horse-power and speed, divide the horse-power by the speed expressed in hundreds of revolutions per minute. The result will, of course, be the required "h.p. per 100 r.p.m."

TABLE OF RATINGS OF TYPICAL MAGNETIC CLUTCH.

Size in.	Ultimate h.p. at 100 r.p.m.	Pull-out torque lb. ft.	Amperes.		Max. r.p.m.
			115 V.	230 V.	
7	0·7	35	0·4	0·2	3,540
10	1·7	90	1·0	0·5	2,840
12	2·8	150	1·0	0·5	2,380
14	4·7	250	1·2	0·7	2,040
16	13·9	732	1·6	0·74	1,790
20	27	1,430	2·0	1·0	1,420
24	47	2,460	2·4	1·4	1,190
28	75	3,920	3·2	1·8	1,030
32	111	5,840	3·2	1·8	900
36	158	8,320	4·8	2·6	800
40	198	10,420	4·4	2·4	710
44	290	15,200	5·2	2·7	650
48	376	19,720	5·5	2·9	600
54	535	28,100	11·4	5·8	530
60	735	38,600	14·0	7·3	480
66	980	55,400	14·1	7·3	425
72	1,270	66,600	17·3	9·1	395
78	2,170	114,000	19·3	10·4	365

Torque is customarily stated in terms of the number of pounds' pull at a radius of one foot. The ratings given in the table represent the point at which each clutch will slip. In selecting a clutch, therefore, the maximum load which the clutch must transmit should be used. The clutch size, which is selected for the installation, should have a rating which provides an ample margin of safety over and above the peak load which has to be transmitted.

As a rule, these clutches are designed with an ample friction surface to take care of the conditions encountered in most industrial installations. Occasionally, however, installations will be found where the load must be started very frequently or where the work done in overcoming the inertia of the load requires an unusual amount of slip between the friction surfaces. In such cases the wear on the standard clutch lining may be excessive, and a larger friction area should be provided to meet these abnormal conditions.

In most cases the driving half of the clutch is mounted directly on the shaft extension of an electric motor, and the driven half on a shaft connected to the load. In such cases the ampere readings on the motor will indicate the peak loads which are encountered. For installations of this type the selection of a clutch is more easily made on the basis of "h.p. per 100 r.p.m."

When selecting a clutch in this manner it is necessary to use the maximum peak horse-power which the clutch may have to drive. Divide this by the speed, in hundreds of revolutions per minute, of the shaft on which the clutch will be mounted; the horse-power per one hundred revolutions per minute thus obtained should be increased by a suitable factor of safety in order to ascertain the proper size of clutch.

Here is an example: A grinding machine is driven by a 150-h.p. motor at 475 r.p.m. The maximum peaks are as high as 310 h.p. The clutch is to be mounted directly on the motor shaft.

Take the peak horse-power and divide it by the speed in hundreds of revolutions per minute:—

$$310/4.75 = 65 \text{ h.p. per } 100 \text{ r.p.m.}$$

Taking a 25 per cent. factor of safety $65 \times 1.25 = 81$ h.p. per 100 r.p.m.

From the table it will be seen that a 32-in. clutch will be required.

A magnetic clutch is often used on a line shaft or for the purpose of driving one of a group of machines which are all driven by the same motor, or the drive may be a steam engine, and the horse-power ratings cannot be obtained conveniently. In such cases the size of the magnetic clutch must be determined on the basis of the maximum torque which it will be called upon to transmit. This torque may be determined by attaching a lever to the shaft on which the clutch will be mounted and measuring the number of pounds' pull which it is necessary to exert on the end of the lever to turn the shaft. The number of pounds' pull on the end of the lever multiplied by the length of the lever in feet gives the torque in pound feet. The test should be made at that point in the cycle of operations at which the peak load will be encountered. In order to select the proper size of clutch, the torque obtained should be increased by a suitable factor of safety.

For example: A paper calender is driven from a line shaft on a steam engine drive. With paper in the calender and the maximum pressure between the rolls, it requires 350 pounds' pull at the end of a 4.5-ft. lever to turn the shaft on which the clutch will be mounted.

$$\text{Torque} = 350 \times 4.5 = 1{,}570 \text{ lb. ft.}$$

Taking a 50 per cent. factor of safety $1{,}570 \times 1.50 = 2{,}360$ lb. ft.

From the table it will be seen that a 24-in. clutch would be required.

It will probably be of interest to give a few details of successful installations of these magnetic clutches.

A 54-in. clutch is installed between the waterwheel and generator of a paper mill, a novel feature being the device for disengaging the clutch should the generator speed exceed a predetermined value. A centrifugal governor opens an electric circuit and disengages the clutch.

A 150-h.p. squirrel-cage motor drives a reciprocating pump through a 30-in. magnetic clutch. The use of the clutch eliminates unloader valves, and the motor runs continuously, the clutch being engaged and disengaged by means of an automatic pressure regulator. When the pressure falls to a predetermined low level, the clutch is engaged and the pump runs until the high pressure limit is reached, when the clutch is de-energised and the motor disconnected from the pump. This particular clutch is operated about thirty times an hour.

Two 16-in. magnetic clutches are used with synchronous motors driving centrifugal pumps in a power plant. The motors, rated at 100 h.p., 1,800 r.p.m., are run continuously, the pumps being started and stopped by means of the clutches. When the pumps are disconnected, the motors run as synchronous condensers, and help to improve the power factor of the system.

In another case a 54-in. magnetic clutch is used with a 600-h.p. synchronous motor driving the line shaft in a rubber mill. Before this motor was installed, the power factor of the system was poor, being only 65 per cent., and the generators were overloaded. By installing this motor the power factor was increased to 90 per cent. This so relieved the generating equipment that there was sufficient capacity to take care of the 600-h.p. motor with some to spare. The magnetic clutch permits the motor to be brought to synchronous speed before the load is applied.

Lost Electric Cooking Opportunities.

THIS was the subject of discussion at the third Electrical Development Association Salesmanship Conference on November 28th, and it was dealt with by Mr. S. C. HURRY, of the Jackson Electric Stove Co., Ltd., by way of opening, in an unusual, but nevertheless effective and interesting, manner.

The chair was taken by Mr. T. A. KINGHAM (Kingston), who, in his preliminary remarks, revealed a novel method that he has adopted of advertising electricity. He makes arrangements with all the auctioneers in his town so that when a shop is empty in a main street he uses it for a few weeks for exhibition purposes. Partly due to this, he said, he had been able to hire out from 75 to 100 radiators, and he was hiring cookers at an average of 20 per week.

MR. HURRY discussed the results of a *questionnaire* containing seven points which he had sent around to 47 electricity supply authorities, of which 70 per cent. replied. The questions were as follows:—

1. Do you consider the claim of a diversity factor of 9 to 10, in the light of your experience, is reasonable, or can you say that after installing, say, 50 to 100 cookers there was no appreciable rise in your peak or overload on your mains?
2. Is it your experience that the electric cooker is such an off-peak load that only coal costs should be taken into consideration as the diversity cost of energy used for cooking?
3. If you consider that something should be added to cover mains increases, do you consider .1d. per kWh a safe figure?
4. Will you give the average cost of installing a service in a private dwelling?
5. Will you give the average number of units used annually for light only?
6. What in your experience would be the average yearly consumption if an electric cooker were installed also?
7. Have you any load curves or charts which you would be prepared to loan?

It was believed that between 60 and 70 supply authorities in the country had a cooker hire or hire-purchase scheme in operation but no attempt was made to get information from all of them. The electric cooker output at the end of this year would be 10,000 and one firm alone had 6,000 of its cookers on hire. Again, among the 20 authorities whose replies were used for the purpose of the paper, there were 8,124 cookers on hire, an average of 406.

The replies to the first question generally agreed that from 9 to 10 was a safe figure for diversity factor, although in some areas it might fall below this and the charts which Mr. Hurry had received should, he said, take a load off the minds of mains engineers who had not yet had much experience of the cooking load. Dealing specially with one chart which related to a block of 32 houses containing three or four rooms each, the average installation was 15 kW and consisted of seven lights, a cooker, kettle, wash boiler, radiator and iron. The maximum demand was between 12 (noon) and 2 p.m., and amounted to 32 kW. Between 8 and 8.30 a.m., the demand was 21 kW and about the same figure between 5 and 6 p.m.

The answers to the second question showed that most of the authorities were agreed that as the load was mostly off-peak, the coal costs plus a small percentage only should be taken into consideration. The speaker's view was that a very small percentage added to the coal costs should cover incidentals and even then leave a margin of profit, part of which should be allocated to reducing the charge for hiring cookers. It was also suggested that the charge for energy for cooking purposes should be adjusted to meet local conditions.

The answers to the third question were generally to the effect that 0.1d. was a fair charge to add for mains increases.

The next three questions were dealt with together. It was agreed by all those who replied that a service put into a house to-day must be capable of supplying a cooker as well as lighting. The average cost of such a service was apparently £6 13s., and the average energy taken for lighting 180 kWh per annum. When a cooker was used, however, this consumption was increased by 1,378 kWh. The author instanced a supply authority which decided to convert 1,000 consumers to electric cooking. Services at £6 13s. represented an expenditure of £6,650. At 6½d. per kWh, the lighting revenue would amount to £4,875, but if cookers were added there would be an additional revenue of £5,742 with energy at 1d. per kWh.

The author asked supply station engineers whether they were getting the fullest revenue and providing the maximum service to the consumers unless they hired electric cookers and ensured that the large expenditure upon copper and material in the streets was bringing in the greatest possible revenue.

In opening the ensuing discussion, the CHAIRMAN suggested that the cost of services for cookers should be borne by the supply authority, and said that at Kingston the loss on Sundays had been reduced from £120 to £20, due to hiring out radiators and cookers. At the same time, he hinted that the manufacturers of apparatus were not doing all they might to back up the supply people.

MR. A. C. BOSTALL (Croydon) asserted that manufacturers had hindered the development of electric cooking through not seeing to it that the apparatus was properly designed, made and tested before it went to the customer. If this had been done there would have been fewer troubles in service. Even with a relatively high charge of £2 per annum for hiring, including maintenance, he found no difficulty in placing cookers because people would have them.

The CHAIRMAN defended the manufacturer to the extent of saying that he was not supported as he should be by the suppliers. One step in the right direction would be for the Electricity Commissioners to increase the loan period on cookers from five to ten years.

MR. F. SELLEY (Marylebone) gave a number of interesting figures taken from actual experience. In the case of 288 flats, the consumption last year, including cooking and heating, was 660,000 kWh, whereas a corresponding number of flats without facilities for heating and cooking, used only 77,000 kWh. In the case of 12 restaurant kitchens, which had an entirely off-peak load, the consumption last year was 1,102,000 kWh. In the case of the 288 flats with cooking and heating supply, the tariff was on the "telephone" system, and the fixed rental amounted to £1,417, whereas the total revenue from the 288 flats which did not take a heating and cooking supply was £1,600. He calculated that ¼d. per kWh was sufficient for maintenance and this worked out at £1 3s. 6d. per cooker and radiator. In the case of a block of flats which he had "free-wired," without any compulsion on the tenants to take a supply, in two months he had connected 85 cookers and 133 radiators on hire, whilst the tenants had bought irons themselves. As an instance of what the development of the cooking and heating load would do for an undertaking, he pointed out that whereas in 1921 the Marylebone Electricity Supply Department supplied 21,300,000 kWh, this figure had risen to 43,700,000 in 1924. Mr. Selley concluded by saying that facilities should be given for teaching electric cooking in schools and training centres.

MR. H. KING (Ilford) said that apparatus was much better than it used to be and that electric cookers were giving every satisfaction in his district. He had about 230 cookers installed and the consumption in such cases was from 1,600 to 2,000 kWh per annum, against from 150 to 200 in the case of other consumers. The number of maintenance calls which had been found necessary was 5 per 100 cookers per week, or 2.6 calls per cooker per annum. The greatest number of failures was in the boiling rings; he advocated the open type of boiling plate.

Another speaker also commended modern apparatus and said that he always passed complaints from users on to the manufacturers. A sum of £12,000 had been sunk by his authority in a hiring scheme and the interest and loan charges amounted to 17½ per cent. This speaker also commented on the great number of failures in the boiling plates and disagreed with loading these to 2,500 W, as this was not suitable for simmering purposes; 1,500 W was sufficient.

MR. W. RITCHIE (Hendon) asked manufacturers to turn out apparatus that could be relied upon for two years without attention. Those using cookers should be taught how to replace a fuse.

MR. F. W. LEEVERS (Hotpoint Electric Appliance Co.) said that houses should be wired in such a way that electric cooking, &c., could be added subsequently without any difficulty.

MESSRS. H. LOVELL (Stoke Newington) and N. W. PRAGNALL criticised manufacturers; the latter suggested that the manufacturers and supply authorities should get their staffs to use electric cookers and so find out the faults in actual use. He further urged that indicators should be fitted to cookers to show that the current was on.

MR. J. W. BEAUCHAMP held out the hope of a great deal being done in 1925 in the way of teaching electric cooking to children at school. There was a mighty business to be done and it only needed energy, demonstration, advertising and prompt service to secure a magnitude of business which it was almost impossible to conceive. With electricity at 1d. and a reasonable hiring scheme, and gas at 3s. per thousand, much business could be done. Greater use should be made of ladies, both as salaried assistants and as voluntary helpers.

MR. HURRY maintained that nobody had answered the question why electric cooking should not be pushed. A noticeable point was that much more business was done at exhibitions where the hiring charge included the wiring than when it did not, and 1s. 6d. per quarter additional for the wiring attracted new users. Manufacturers asked for the co-operation of the supply authorities and users and they should be given more credit and be trusted more than they often were now. At the same time, he reminded the supply authorities that the manufacturers only got one profit on the sale of a cooker—and a very small one at that—whereas the supply authorities were getting revenue all the time. The question of an indicator to show when the current was on was a sound point and was adopted before the war, but it had since been abandoned because of the cost.

The Institution of Electrical Engineers.

Annual Dinner of the South-Midland Centre.

THE annual dinner of the South Midland Centre of the Institution of Electrical Engineers was held at the Grand Hotel, Birmingham, on Friday last. The chair was taken by Mr. W. Lawson, chairman of the Centre.

Sir JOHN SNELL, Chief Electricity Commissioner, in proposing the toast of the Institution of Electrical Engineers, spoke of the purpose of the Institution as that of a body of scientific persons who were devoting themselves to the applications of electricity in its many forms for the use and convenience of man, and to fitting the younger generation to take their place in this work in the years to come. It was sometimes said that this country was behind the times compared with other countries, but they, as members of the Institution, knew better. Switzerland possessed great natural resources in the shape of water power, and since the coming of electricity that "white coal," as it was called, had been used to its fullest extent for lighting, cooking, heating and transport purposes. In this country they were not blessed with the same amount of water power, but they had great reserves of coal which had been terribly wasted in past years. With the better use of electricity that could be avoided. It was part of their duty, as members of this industry, to assist in bringing about an improvement. He believed that in the course of a few years they would see great electrical extensions; large generating stations would be erected on the Clyde, Tees, Tyne, Mersey, Severn, Thames, and Trent, and would be connected together by main transmission lines, the railways would be electrified, and the more sparsely populated districts would be supplied with electricity.

Capt. J. M. DONALDSON, M.C., member of council, replied.

Mr. R. A. CHATTOCK, city electrical engineer, Birmingham, in submitting the toast of "The Electrical Industry," said the industry in Birmingham had not felt the slump in trade—in fact, the increased demand they had had to meet last year and this year had been phenomenal. They were growing at an increasing rate, and that must mean a greater amount of business for those engaged in the industry. The outlook, so far as they were concerned, was undoubtedly bright. He strongly protested against the proposed change of frequency from 25 to 50 cycles, which would involve colossal cost and great inconvenience, without benefiting anyone. It would be better to spend the money on railway electrification. As to the proposal for trunk lines, he had ascertained that to couple up that district with two other large districts would cost from half a million to a million sterling, according to the capacity installed. If that was to be done in order to promote reliability, he thought it could be done better by laying down extra plant in certain districts. The proposal to have large power stations on the waterways would mean that power could be generated more cheaply, but the transmission of electricity would cost a very considerable sum and that would add to the cost to the consumer to a large extent.

Mr. P. J. PYBUS, M.B.E., in replying, said there was one phase in which the development of electricity in this country was far behind that of almost any other; he meant the agricultural and completely rural areas. Whatever improvements might be necessary regarding increased facilities in the large towns and the general electrification of railways, there was no doubt that the rural and agricultural areas had been shamefully neglected. Many of them representing electrical manufacturing concerns in this country were busy on main-line electrification contracts in all parts of the world. Their position was rapidly becoming Gilbertian in so far as they were preaching all over the world the gospel of main-line railway electrification with considerable success, and yet in this country no scheme had yet been undertaken.

If he were asked to give an opinion as to the direction in which the use of electricity was most backward in this country, he would without hesitation point to the agricultural areas. He commended the view to the Minister of Agriculture—that it was in this direction that he could, at very small cost, do something immediately to help agriculture in this country; to help the farmer to live against world competition and to give him, through the use of electricity, some, at least, of the amenities which were enjoyed by the smallest farmer in other countries.

Mr. C. GRANT ROBERTSON, principal of Birmingham University, in proposing the toast of "The City of Birmingham and Electricity Supply," remarked that it was undeniable that in the last 30 or 40 years Birmingham had been a great pioneer in the task of showing what a great city could do by municipal enterprise on the lines of assisting civil development through organised science. He emphasised the importance of keeping this country in the forefront of science.

Coun. H. K. BEALE, chairman of the Birmingham Electric Supply Committee, in responding, said they were not only pushing farther and farther afield in Birmingham, but they were looking for fresh directions in which to educate the public in the use of electricity. They were anxious to get people more and more to use electricity instead of raw coal. Immediately after Christmas he was going to ask the City Council for a further £750,000 for developments in Birmingham.

Mr. W. LAWSON, chairman, proposed "Kindred Societies and Guests," and

The BISHOP OF BIRMINGHAM, in replying, said humanity had passed through ages of stone, bronze, and iron, but this was the age of electricity. When our follies were forgotten, when wars and national jealousies were merely the dead matter of history, the triumphs of electrical invention and discovery which belonged to this era would be gratefully remembered by posterity. They were living at a time when those who loved intellectual progress felt that it was good to be alive, but when they turned to social conditions the splendour faded, for behind their triumphs lay their failures. Social disorder, squalor, and misery—to all these problems they needed to apply the energy and the enthusiasm which they gave to their profession.

The dinner was the largest and most successful so far held in Birmingham, there being present some 240 members and guests.

Legal.

British Thomson-Houston Co., Ltd., v. Charlesworth, Peebles & Co.

LORDS HALDANE, DUNEDIN, SHAW, BUCKMASTER and BLANESBURGH commenced the hearing, in the House of Lords on December 1st, of this case, which is an appeal from a judgment of the First Division of the Court of Session in Scotland, in an action relative to the alleged infringement of a patent belonging to the respondents for an invention of "Improvements in and relating to the treatment of tungsten to facilitate working." There is also before the House an appeal from the English Court of Appeal in the plaintiffs' case against the British Insulated & Helsby Cables, Ltd., upon the same point. While the Scottish Court held the patent to be valid, and to have been infringed, the English Court (reversing Mr. Justice Russell's decision) held it to be invalid.

It was arranged, after a brief discussion, that as the Scottish action was commenced first, it should be argued first, though no decision would be given before both had been heard.

It was explained that the respondents, as owners of letters patent 23,499, of 1909, sued the appellants (Charlesworth, Peebles & Co.), alleging infringement and claiming interdict and damages. The appellants pleaded invalidity and no infringement. The Lord Ordinary and the First Division of the Court of Session (Lord Skerrington dissenting) held the patent valid, and that it had been infringed, and had interdicted the appellants, the question of assessing damages being held over.

Sir DUNCAN KERLY, in opening the case for the Scottish appellants, said that the manufacture of filaments for incandescent lamps was a very important matter. The money value involved was enormous, and it was naturally being fought with all the strength of the parties. Both actions were relative to precisely the same point, in connection with this patent of 1909, but different decisions were given upon it by the Scottish and English Courts. Counsel then proceeded to describe in detail the specification relative to the letters patent, by means of long printed matter. The hearing is likely to occupy some time, there being big volumes of evidence, &c., to be gone into.

Sir Duncan continued his address on Tuesday, and the case was adjourned to Thursday (yesterday).

Charge Against a Liverpool Councillor.

THE charge against Capt. A. Angers, a member of the Liverpool City Council, of the fraudulent consumption of electricity (reported in our last issue) was dismissed on November 25th. The magistrate said that although the police had been quite justified in bringing the charge, there was evidently no intention on the part of Councillor Angers to commit the offence. The charge would be dismissed, and there was not the slightest reflection upon the defendant's character.

British Thomson-Houston Co., Ltd., v. Symper and Evershed.

IN the Mayor's and City of London Court, on November 27th, before the Common Serjeant, Sir H. F. Dickens, K.C., a claim was made by the plaintiffs against Messrs. Symper & Evershed, of Harrow, for £13 8s., balance of account for radio apparatus supplied to them. For the plaintiffs it was stated that the action was commenced in the Birmingham Registry of the High Court and was brought for a sum of £22 5s. 4d. The defendants brought into Court £8 16s., leaving in dispute the balance now sued for, which was in respect of a crystal-valve radio receiving set. Plaintiffs' case was that the defendants were opening a new showroom at their premises in August, 1923, and wanted radio apparatus for display purposes. A representative from the plaintiffs' radio department called upon the defendants in August, taking with him the receiving set in question, and it was arranged that it should be left at the defendants' showrooms on approval for 14 days. On August 31st defendants wrote stating that they understood that they were to have the goods "on sale or return." They were informed that the goods were on approval for 14 days. Unless they were then returned they would be considered

sold. The defendants had kept the set ever since. The defence was that the crystal-valve set delivered to them by the plaintiffs was defective. Plaintiffs were told that they (defendants) did not accept the apparatus and plaintiffs were at liberty to take it away whenever they chose to do so. Defendants contended that they had never done anything to recognise acts of ownership. The Common Serjeant found in favour of the plaintiffs, for whom judgment was entered with costs.

Claim by the Sun Electrical Co., Ltd.

IN the High Court at Dublin, before Mr. Justice Johnston and a common jury, recently, the case of Buchalter *v.* the Sun Electrical Co., Ltd., was listed for the decision of an issue.

In the original action the Sun Electrical Co., Ltd., were the plaintiffs, and John Cheroz, Dublin, was the defendant. The action was brought to recover £19 12s. for goods sold and delivered, and the plaintiff company obtained a decree for the amount, with costs. When the Sheriff went into possession the goods seized for the defendant were claimed by Simon William Buchalter, and on the application of the Sheriff an issue was directed on the ownership of the property.

Mr. COSTELLO, B.L., who appeared for the plaintiff, said that the claimant had been advised that he could not establish his claim, and consequently he asked the jury to find that the goods were properly taken in execution.

The Sheriff was directed to pay the amount of the judgment to the Sun Electrical Co.

Business Notes.

Bankruptcy Proceedings.—B. L. BANKS and W. BANKS (B. & W. Banks), electrical and wireless engineers, 18, Watergate, Rothesay.—The estates of the above were sequestrated by the Sheriff of Renfrew and Bute on November 19th. A meeting to elect a trustee and commissioners was called for December 3rd at the Norman Stewart Institute, Rothesay. Mr. J. Hogg, agent, 186, Argyll Street, Glasgow.

E. E. CLARKE, electrical engineer, late of 4, Alhambra Buildings, Lancashire Street, Morecambe.—Receiving order made November 20th on creditor's petition.

W. E. WEEKS, wholesale electrical dealer, 59, Victoria Street, and 12, Filton Avenue, Horfield, Bristol.—Trustee, Mr. J. P. Emmett, 18, Nicholas Street, Bristol, released October 22nd.

P. BOSWELL (Boswell & Co.), electrical engineer, 110, Ebury Street, S.W., and 132, Earls Court Road, S.W.—First and final dividend of 11d. in the £, payable at Messrs. Poppleton, Appleby & Hawkins, 4, Charterhouse Square, E.C.

H. RHODES (Victoria Electrical Co.), kinema operator, Victoria Buildings, Keswick.—First and final dividend of 2s. 5d. in the £, payable December 9th, at the Official Receiver's office, 34, Fisher Street, Carlisle.

D. E. JONES (D. E. Jones & Co.), electrical engineer, 29, Carne Street, Pentre, Glam.—First and final dividend of 9s. 5½d. in the £ payable at the Official Receiver's office, 31, Park Place, Cardiff.

S. L. BAPTY and N. MILES (Wireless Instrument Manufacturing Co.), wireless instrument manufacturers, Avenue Works, Avenue Road, Willesden Junction, N.W.—Last day for proofs for dividend, December 12th. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

J. E. ELLIOTT & J. M. ELLIOTT (separate estates), trading as J. E. Elliott & Co., electrical engineers, 12, Broad Street, Oxford.—Last day for proofs for dividend, December 16th. Trustee, Mr. W. Boyle, Senior Official Receiver, Carey Street, W.C.

Company Liquidations.—MIDLAND ARC ELECTRIC WELDING CO., LTD.—A meeting of members is called for January 2nd at the offices of Messrs. H. Bradfield & Sons, 13, St. Peter's Gate, Nottingham, to hear an account of the winding up from the Liquidator, Mr. T. E. Clarke.

CONNOLLY BROS., LTD.—Last day for proofs for dividend, December 18th. Liquidator, Mr. I. M. Henderson, 2, Moorgate Buildings, E.C.

"F.S." PETROL ELECTRIC OMNIBUS CO., LTD.—Winding up voluntarily. Liquidator, Mr. S. H. Clinch, 119, Moorgate, E.C. Meeting of creditors at the Liquidator's offices, December 11th. Particulars of claims by December 6th.

BIRMINGHAM WIRELESS CO., LTD.—Particulars of claims to be sent to the Liquidator, Mr. S. W. Hart, 3, New Street, Birmingham, by December 31st.

Private Arrangements.—JAMES GRAY, LTD., heating, lighting, and general engineers, Danvers Street, Chelsea, S.W.—The creditors interested herein were called together on November 28th, when Mr. A. Gray presided. Mr. Buckingham, of Messrs. L. H. Lemon & Co., C.A., said that the business had been in existence for about 80 years. The position that had now arisen was due to the fact that the company was short of capital. It had been proposed that the company should go into liquidation, but as the bank held debentures which covered the whole of the assets, it was deemed advisable to call the creditors together first to consider the position. The bank held debentures for £5,000, while there were second debentures for £2,450 held by Mr. Gray and Mr. Anderson, but those had also been charged to the bank. The trade creditors claimed £7,114, while there were loan creditors for £1,787. The assets totalled £16,468. Mr. Martin, of Messrs. McLintock & Co., C.A., said that he had been appointed manager and secretary. The creditors had been called together to be asked that they should not take any proceedings against the company for a period of three months to enable fresh capital to be found if possible. If the creditors would wait three months he was sure they would receive 20s. in the £. If the company was forced into liquidation, the bank would appoint a receiver. Finally a resolution was passed agreeing to the proposal.

A. H. PAFFORD, electrical engineer, 66, High Street, Gosport.—A meeting of the creditors of the above was held recently, when a statement of affairs was presented which showed ranking liabilities of £507, of which £467 was due to the trade and £40 to cash creditors. There were also fully secured creditors for £1,083, who held securities valued at a similar amount. The assets totalled £151, from which had to be deducted £30 for preferential claims, leaving net assets of £121, or a deficiency of £386. It was reported that debtor started business in April, 1920, with a small capital. Subsequently he purchased the freehold house and shop at Gosport, raising mortgages of £1,050. An offer had been received to purchase the properties for the amount of the mortgages, and also to take over the stock, fixtures, &c., at a sum of £100. It was agreed to confirm the deed of assignment already executed, whilst a committee of the principal creditors was appointed.

Dissolutions of Partnership.—HEMBER & MALBY, electrical engineers and contractors, "Westward Ho," Ellis Road, Clacton-on-Sea.—Mr. L. E. Hember and Mr. F. Malby have dissolved partnership. Mr. Malby will attend to debts and continue the business.

C. TAYLOR & Co., automobile and electrical engineers, Westfield Road, Horbury, York.—Messrs. C. Taylor and A. Brook have dissolved partnership. Mr. Taylor will attend to debts and continue the business under the same style.

ELECTRICAL REPAIRS CO., electrical engineers, 1, Broad Street, Manchester.—Mr. H. Haughton and Mr. W. H. Hancock have dissolved partnership. Mr. Haughton will attend to debts and continue the business.

We are informed that MESSRS. DAWSON & EVANS have dissolved partnership with Mr. C. R. St. John, and are practising as consulting engineers under their old title—Dawson and Evans—at Windsor House, Westminster, S.W.1.

Trade Announcements.—MESSRS. ASHFORD & Co., electricians, of Windsor Lane, Plymouth, have purchased the premises occupied by Mr. W. S. Gerry, hardware merchant and sanitary engineer.

FULLER'S UNITED ELECTRIC WORKS, LTD., has acquired new premises at 22, Temple Street, Bristol ('phone: Bristol 2531), where a full range of the company's cables, accumulators, and radio apparatus will be stocked.

MESSRS. BLANDFORD & Co., the Wireless Stores, Cobham Street, Gravesend, have taken larger premises at 6, Wrotham Road.

Mr. T. T. D. GEESIN is not now acting as London agent for Messrs. Rayner & Heald, Ltd., of Derby. Communications should be sent to the company at their office at Craven House, Kingsway, London, W.C.2, where their London business will be conducted under the supervision of Mr. Aubrey V. Clayton, their chief engineer.

MR. W. E. WARRILOW has sold his partnership interest in Lionel Robinson & Co. to Mr. Lionel Robinson, who will continue the business of general and wireless engineers and merchants at 3, Staple Inn, W.C.1. Mr. Warrilow will again take up engineering advertising and technical journalistic work. For the present his address will remain as above.

MESSRS. HENRY FREEDMAN & Co. have removed to 18, Bevis Marks, E.C.3.

Catalogues and Lists.—THE FAME ELECTRIC CO., City Mills, High Street, Stratford, E.15.—A price list of d.c. and a.c. motors, including fractional horse-power machines.

MESSRS. FALK, STADELMANN & Co., LTD., 83-87, Farringdon Road, E.C.1.—Catalogue No. 522, containing details, prices and illustrations of radio receiving sets and components, and a priced folder illustrating and describing crystal and valve sets.

MESSRS. KELVIN, BOTTOMLEY & BAIRD, LTD., 18, Cambridge Street, Glasgow.—Two illustrated pamphlets describing, respectively, the "K. B. B." vibrometer for detecting vibration in machinery, and the "Kelvite" unit system of heating and ventilating.

MARCEL PORN, 21, Mincing Lane, E.C.3.—A well-illustrated brochure describing the electric lifts produced by the Officine Meccaniche Stigler, Milan.

THE ENTERPRISE MANUFACTURING CO., LTD., Grape Street, W.C.2.—A pamphlet (priced) advertising variable grid leaks, variable anode resistances, and crystals.

THE BRUSH ELECTRICAL ENGINEERING CO., LTD., Falcon Works, Loughborough.—Publication 1,004, containing an illustrated reproduction of an article from the *Power Engineer* describing Brush-Ljungström plant in a cement works.

THE ELECTRIC HEATING CO., Croydon.—A mailing card advertising the "Elect" soldering iron and smoothing iron.

MESSRS. DONOVAN & CO., 47, Cornwall Street, Birmingham.—A small blotter advertising the firm's lamp-selling business.

THE MIRRLEES WATSON CO., LTD., Scotland Street, Glasgow.—Pamphlet No. Pu. 950, containing a list of installations of the company's steam ejector air pumps. Illustrated.

FULLER'S UNITED ELECTRIC WORKS, LTD., Woodland Works, Chadwell Heath, Essex.—An illustrated descriptive pamphlet dealing with the "Little Sparta" loud speaker.

MESSRS. BUCKLEY, SAUNDERS & CO., LTD., 8, Princes Street, Westminster, S.W.1.—Publication No. 252, containing an illustrated description of "Pontelec" electric rivet-heating machines.

WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., Newark, New Jersey, U.S.A.—Publication S.P. 1,666, describing the company's protective relays for a.c. and d.c. systems.

MESSRS. DUNCAN, WATSON & CO., 61 and 62, Berners Street, W.1.—Two illustrated pamphlets describing, respectively, the "Kookrite" electric cooker, and the "Rotarex" vacuum cleaner.

MESSRS. L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, W.C.2.—A letter-folder illustrating the new "Duplex-a-Lite" table lamp, and a pamphlet dealing with the "Universal" vacuum cleaner, bowl fire, and other appliances (priced).

POPE'S ELECTRIC LAMP CO., LTD., 5, Arthur Street, New Oxford Street, W.C.2.—An illustrated pamphlet (No. 3427), giving prices of various patterns of "Elasta" drawn-wire lamps.

PREMIER ELECTRIC HEATERS, LTD., Keeley Street, Watery Lane, Birmingham.—A priced and illustrated pamphlet dealing with several patterns of electric fires.

The British Industries Fair.—Next year's Fair, as announced in our last issue, is to be held at Birmingham only, from February 16th to 27th. As usual, there will be sections devoted to brassfoundry, hardware and ironmongery; metals; construction, building and decoration; power, lighting, cooking and ventilating; engineering; agriculture; mining; motors, cycles, &c.; guns, saddlery, &c.; brewing, distilling and catering; and "services." In addition, there will be five extra groups to accommodate exhibits which would normally be shown in London; these include scientific and medical instruments and appliances, and china, earthenware, and glass.

The Barking Strike.—As briefly announced in our last issue, the strike of men engaged in electrical constructional work at the new Barking power station terminated last week. Under the agreement reached between the Electrical Trades Union and the Engineering Employers' Federation, the men were reinstated and the employers were to continue their usual practice as to the rates of wages payable. The employers' side of the Joint Industrial Council had previously agreed to consider the insertion of a condition in future contracts that the rates of wages current in the electricity supply industry should be paid by outside contractors for installation work. The Engineering Employers' Federation, however, states that it reserves its right to take such action as is deemed desirable upon any decision which may be made in this respect.

Wages in the Electricity Supply Industry.—The first District Council for the Electricity Supply Industry to take action in the matter of the recent agreement with regard to wages, approved by the National Joint Industrial Council for the industry, is that for the North-East Coast. This was the district specially mentioned as having enforced certain wage reductions in a time of slump. It has been agreed that wages shall be increased by 10 per cent. as from May 16th last, the minimum increase being ½d. per hour.

The employers' side of the District Council for the North-Western Area considers that there are no anomalies in the present rates of the area, and therefore it is anticipated that the matter is ended, so far as that area is concerned.

Norwegian Developments.—The Association of Norwegian Electrical Works has decided to form a co-operative buying organisation. Membership of the organisation will be optional, however, and members will not be bound to purchase solely through the organisation. At the same meeting the Association decided to adopt regulations to ensure the uniformity and safety of electrical installations throughout the country.

United States Electrical Exports.—A review of the United States electrical trade during September in a recent issue of *Commerce Reports* shows that, although the total value of exports was in excess of that for the corresponding month of 1923, there was a decline from the August figure. The total was $6,108,639, as compared with $7,188,370 in the preceding month. There was a considerable decrease in the exports of generating plant and transformers, although in one item—steam generator sets—there was a small rise. The exports of switchgear, motors, lamps, heating devices, and telephone equipment were also lower. Radio apparatus, however, continued its upward progress, and there were improvements in the cases of wiring devices and materials, and meters.

Book Notices.—"Practical Radio," by J. A. Moyer and J. F. Wostrel. Pp. vii+249; figs. 169. Price 8s. 9d. "Substation Operation," by E. Kurtz. Pp. xiii+261, figs. 207. Price 12s. 6d. "Electrical Drafting and Design," by C. C. Bishop. Pp. viii+165. Illustrated. Price 10s. London: McGraw Hill Publishing Co., Ltd.

"Engineering Workshop Notes and Data," by E. and F. E. Price. 126 pp. London: Crosby Lockwood & Son. Price 2s. 6d. net.—This useful little booklet of tables and other data is principally of use in connection with machine tools—milling machines, lathes, shafts and pulleys. There is also, however, a great deal of information regarding the hand tools in common use in workshops, as well as particulars of heat-treatment of metals, gear-cutting and general notes.

"Patents Invention and Method," by H. E. Potts. Pp. vii+160. London: The Open Court Co. Price 3s. 6d. net.

"Relativity and Common Sense," by F. M. Denton. Pp. xvii+279; figs. 82. London: Cambridge University Press. Price 10s. 6d.

"Science Abstracts, A and B." Vol. XXVII. Part 11. November 25th, 1924. London: E. & F. N. Spon, Ltd. Price 3s. each.

"Storage Batteries," by G. W. Vinal. Pp. viii+402; figs. 156. London: Chapman & Hall, Ltd. Price 22s. 6d. net.

"Pitman's Radio Year Book, 1925." Pp. x+175 Illustrated. London: Sir Isaac Pitman & Sons, Ltd. Price 1s. 6d. net.

"Scientific Research and Human Welfare," by F. S. Harris. Pp. vii+406. London: MacMillan & Co., Ltd. Price 12s. net.

"Problèmes d'Electrotechnique," by A. Churchod. Paris: Librairie Scientifique A. Blanchard. Price 48 fr.

The second number of the journal of the County of London Electric Supply Co. Social Society has been given the title of "County π." It is full of interesting notes with a seasoning of humour.

"Kelvin Centenary Oration and Addresses Commemorative." Report of the proceedings held July 10th, 1924. London: Percy Lund, Humphries & Co., Ltd. Price 6s. net.

For Sale.—By direction of the George Cohen and Armstrong Disposal Corporation, Messrs. Fuller, Horsey, Sons and Cassell will sell by auction on December 15th, at C.S.D. No. 5, Wood Lane, Shepherd's Bush, W.; plant and machinery, including electric locomotives, generating sets, motors, &c.

Mr. H. J. Shaw will sell by auction, on December 8th, at 85, Newington Causeway, electrical and wireless goods and materials.

The London Trade Sales Rooms, Ltd., will offer by auction, on December 11th, at 24 and 26, Holborn, E.C., the stock of an electrical engineers' merchant. (See this week's issue.)

Local Exhibitions.—PAISLEY.—The Corporation Electricity Department is holding an exhibition and demonstration of electrical appliances this week, concluding to-day (Friday).

RADCLIFFE.—To encourage the use of electricity in the home the Electricity Committee is holding an exhibition of domestic electrical appliances and accessories, which will be continued until the end of January.

HALIFAX.—The Corporation Electricity Department and the Gath Electrical Engineering Co., were amongst the exhibitors at a Trade Revival Exhibition organised by Halifax traders at the Drill Hall last week. There were exhibits of almost every kind of retail trade, including radio apparatus and household electrical and other appliances; demonstrations of these were given daily.

Italian Electrical Trade.—A preliminary report upon the electrical trade of Italy during the first six months of the current year show that there was a slight increase in quantity and value as compared with the equivalent period of 1923. The value of exported motors and generators was again in excess of the value of similar imported plant. Germany retained its lead in the import list, but Great Britain's contribution was still of small proportions.

Swiss Water-power Exhibition.—It is proposed to hold an Inland Navigation and Water-power Utilisation Exhibition in Basle in 1926.

Wembley Next Year.—The *Daily Telegraph* of Monday last published the views of Sir Robert Hadfield regarding the proposal to re-open the Wembley Exhibition in 1925. Briefly, these are that the 1924 Exhibition was very costly indeed to exhibitors, and while it may have produced plenty of business for those who were selling raw products, customers did not come to big engineering exhibitors with orders in their pockets. Personally, Sir Robert doubts whether the Exhibition can be a paying proposition from the manufacturers' point of view. As a general asset to the Empire, a 1925 Exhibition ought to be encouraged, but the Government ought to come to industry's assistance with free space. He brought the matter before Mr. J. H. Thomas, the then Colonial Secretary, in October, and the suggestion was forwarded to the Exhibition authorities, but the General Election intervened. The *Daily Telegraph* mentions that as the result of inquiries made in other quarters, it is found that the attitude in engineering circles toward reopening is not unsympathetic, but no definite decision has been arrived at by engineering exhibitors as a whole. It is suggested that the Palace of Engineering should be closed at seven in the evening instead of ten.

Applications for Cancellation of Patent Endorsement.—Aktiengesellschaft Brown, Boveri & Cie. have applied for the cancellation of the endorsements "Licences of Right on Letters Patents No. 138,855 of 1919," and granted to them for "Improved Methods and Apparatus for Regulating Centrifugal Compressors"; and No. 138,592 of 1919, for "Improved Apparatus for Varying the Adjustment of the Guide Blades in Centrifugal Compressors."

Electrical Trade Commercial Travellers and Representatives.—A meeting of sales engineers and travellers engaged in the electrical trade will shortly be held for the purpose of forming an association to assist and further the interests of commercial travellers in the electrical trade. It is proposed that this association shall be affiliated to the British Commercial Travellers' Associations Federated, Southern Federation. All members of the travelling sales staff of electrical firms are invited to be present. They will be admitted on production of their trade card. It will greatly assist the organisers if those interested and intending to be present will notify the hon. secretary (*pro tem.*), Mr. R. F. Norris, 235, Sheen Lane, East Sheen, S.W., who will also welcome any suggestions in advance.

New Belgian Companies.—A new company, styled the Tramways et Electricité de Constantinople has been formed at Ixelles-Bruxelles (48, Rue de Naples), with a capital of 90 million francs, to erect, acquire, and operate electrical undertakings in Turkey.

A company has recently been formed in Antwerp (33-35, Rue Loos), with a capital of one million fr. and the title La Société Radio A.C.T.I., to deal in radio-telegraphic and telephonic goods.

British Trade Mark Applications. — The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from the date mentioned. In the case of foreign applications, the name and address of the British representative are also given :—

Megoma. No. 452,156. All goods included in Class 5.—Albert Vandam, Caxton House, Westminster, S.W.1. November 26th, 1924.

Dorm. No. 441,489. Class 8. A telephone attachment of ordinary metal for use in muffling the voice when speaking into the receiver.—W. Watson & Sons, Ltd., London, W.C.1. November 26th, 1924.

Dubilier. No. 447,532. Class 8. Electric condensers, resistances, and variometers.—The Dubilier Condenser Co. (1921), Ltd., London, W.12. November 26th, 1924.

Eclipse. No. 450,432. Class 8. Variable condensers, low frequency intervalve transformers, and ebonite coil holders for use in wireless telegraphy and telephony.—P. & C. Manufacturing Co., Ltd., 6, Bath Street, City Road, London, E.C.1. November 26th, 1924.

Heart. No. 450,508. Class 8. Loud speakers and headphones, being instruments for use in wireless telephony.—Adolf Knopf, trading as the Wholesale Guarantee Incandescent Supply Stores, 25, Waterloo Road, London, S.E.1. November 26th, 1924.

Gramophone and Loud Speaker Design. No. 450,637. Class 8. Wireless telephonic apparatus, and parts and accessories therefor, &c.—Polyphonwerke Gesellschaft, 76, Markgrafenstrasse, Berlin, S.W.68, Germany. (F. W. Goldby, 3, John Street, Bedford Row, London, W.C.1). November 26th, 1924.

Re-Echo (lettering and design). No. 452,860. Class 8. Instruments and apparatus for use in wireless telephony and telegraphy.—The Re-Echo Radio Co., Ltd., 43, Johnson Street, Westminster, S.W.1. November 26th, 1924.

M (lettering and design). No. 444,510. Class 13. Electrically-operated buzzers, sounders, and bells, electric resonators, electric soldering irons, domestic electrical appliances, wiring devices, switches, &c.—Manhattan Electrical Supply Co., Inc., 17, Park Place, New York, U.S.A. (Fell & James, 11, Queen Victoria Street, London, E.C.4). November 26th, 1924.

The North-Western District Council.—The annual conference of authorised undertakers in the North-Western Area took place at Manchester on November 25th. The work of the year was reviewed and representatives of the employers were elected to the District Council (No. 3) and the District Joint Board for the ensuing year. We have received a list of these from the employers' secretary.

New Swiss Company. — The Società Ardor Fabbrica di Apparechi Elettrici is the name of a new electrical apparatus manufacturing concern which has just been formed at Giubiasco (Canton of Ticino). One of the directors of the Swiss Locomotive and Engineering Co., of Winterthur, is connected with the new undertaking.

Radio Retailers and Discounts.—Radio retail traders met at Sheffield last week and passed a resolution that instead of the present arrangement of rebates on quantities, a preferential discount over and above the present discount should be given to members of the Retailers' Section of the National Association of Radio Manufacturers and Traders.

Marking Goods for Denmark.—The *Board of Trade Journal* reports that decrees recently promulgated by the Danish Government require that electricity meters, dynamos, motors and transformers, shall be marked with the name of the country of origin. If more than one foreign country is concerned in the manufacture of the goods they are to be marked "Foreign manufacture."

Salford Tramwaymen's Wages.—The recommendations of the tribunal set up by the Joint Industrial Council for the Tramways Industry have been accepted by the Salford tramway workers. The men, however, have passed a resolution instructing the secretary of the North-Western Area of the Transport and General Workers' Union to make application for an additional 1s. 6d. per week for guards, so as to restore the difference of 1s. per week between them and the drivers.

Swiss Electrical Exports.—Electrical machinery and locomotives to a value of 20,284,000 fr. were exported from Switzerland during the nine months ended with September last.

Electrical Imports into the Irish Free State.—The imports of electrical machinery and apparatus and accessories into the Irish Free State during September last attained a value of £30,493—as compared with £29,337 in the preceding month—bringing the total for the first nine months of the year to £342,324. The appended table shows the details of the imports and the amount attributed to Great Britain and Northern Ireland. It is pointed out in the official returns that the values show the quantity of goods consigned from the countries mentioned, and that it does not follow that they are all of British manufacture. Of the balance of £21,793 from foreign countries, £9,806 is attributed to Germany, £5,451 to Belgium, and £6,536 to "other countries."

	Total. Sept., 1924.	Nine months 1924. Total.	U.K. share.
	£	£	£
Electric wires and cables ...	6,290	55,882	43,468
Telegraph and telephone instruments	1,476	24,018	23,893
Electric lamps and parts ...	2,434	14,587	13,496
Batteries and accumulators ...	3,592	17,193	16,336
Electric lighting accessories and fittings	3,207	21,650	20,837
Radio sets and apparatus ...	2,631	78,615	76,997
Other electrical goods and apparatus	3,705	78,911	75,577
Electric generators	552	6,864	6,726
Electric motors	1,075	12,760	12,175
Other electrical machinery ...	5,931	31,844	31,026
Totals ...	£30,493	£342,324	£320,531

Social Events.—Henley's Dramatic Club is to be heartily congratulated on the excellence of its presentation of Ian Hay's comedy "Tilly of Bloomsbury," on Friday evening last, at the Cripplegate Institute. Miss Dot R. Josling played the part of Tilly to perfection, while Mr. W. G. Turner as Abel Mainwaring, M.P., Mr. Frank Bettley as Mr. Stillbottle, Miss Starbuck as Grandma Banks, Mr. R. D. Benjamin as the Rev. Adrian Rylands, and Mr. H. Stanley as Lucius Welwyn, all left a very favourable impression—indeed, everybody did well, even taking into account the obvious signs of disadvantage under which "Percy's" mother laboured. One was sorry to learn that Sir George Sutton, the president, was too indisposed to be present; also that one of the patrons, Mr. W. J. Potter, was ill. Mr. Percy Rosling, M.I.E.E. (general manager of Henley's), was present. The play was produced by Mr. Henry Thornton. Mr. L. F. Cole is the honorary secretary of the club. Henley's (Head Office Staff) Social Club holds a Grand Carnival and Dance on New Year's Eve.

The staff of Messrs. Johnson & Phillips, Ltd., held a successful social evening on November 21st, in the Town Hall, Woolwich. Dancing was the chief feature of the programme, but miniature whist drives were also provided, and the proceedings were varied by musical interludes. The attendance of members of the staff and their friends numbered nearly 300. The prizes for the whist drives, kindly provided by Mrs. Stewart, wife of Mr. Chas. Stewart (director), and by those members of the provincial staffs who were unable to attend, were presented to the winners by Mrs. Macgregor and Mrs. Stewart. The next J. & P. staff evening will be held in the same hall on January 9th next.

Over 2,500 attended a whist drive and social for the benefit of Blackpool Hospital, organised recently by the Electricity and Tramways Institute. Mr. C. Furness, engineer, presided over the function, which was a brilliant success.

The annual staff dance of the Paisley Electricity Department was held recently at the Town Hall. Music was provided by Mr. Dick's orchestra, and impressive lighting effects were arranged by the Department.

The fourth annual dinner of the G.W.R. Telegraph Department staff was held in the Richelieu Room at the Hotel Cecil on November 22nd. Mr. Charles Gibbs, the telegraph assistant to the superintendent of the line, presided, and many of the company's principal officers were present. Sir Felix J. C. Pole was unable to attend owing to indisposition. Among the toasts was that of "The Chairman," proposed by Mr. E. J. Collier. He referred to the early days of the Telegraph Department, the pioneer work, and the gradual development which had brought about present up-to-date conditions. Mr. Gibbs, who is retiring shortly, in reply, said that he had done his best to raise the status of the Telegraph Department, and emphasised the fact that all the other departments relied on its services. A musical entertainment was provided by Messrs. A. W. Allen, A. J. Gardner, A. Griffiths, J. Horrobin, J. Jarvis, A. North, F. Roberts, J. B. Tuffrey, J. W. Sealey, and Mr. A. G. Meacham (accompanist).

French Electrical Imports and Exports.—Returns lately issued show that the imports of electrical machinery and apparatus into France during the six months ended with June last attained a value of 99,296,000 fr. as compared with only 64,608,000 fr. in the corresponding half of 1923. During the same period the exports of similar material of French manufacture advanced from 127,691,000 to 190,768,000 fr.

Ford Magneto Litigation.—The United States Supreme Court has refused to consider the action brought by Mr. Edward S. Huff against Mr. Henry Ford in respect of a claim for $11,000,000 royalty on the Ford flywheel magneto. Mr. Huff claimed to have been paid $10,000 by Mr. Ford for the invention, but he also asserted he was to receive $2.50 for each magneto used on 4,500,000 cars. In the lower Federal Courts it was held that Mr. Huff had neglected to press his claims within the time allowed by law.

New London Showroom.—The HENDON ELECTRIC LAMP CO. has recently opened a showroom at 104, Southampton Row, W.C.2, where, in addition to many examples of its lamps, the company has a display of fittings and appliances for which it holds agencies. Among these is a series of "Artlight" shades and bowls in which a translucent body is covered with cretonne of a variety of designs, giving very pleasing effects. Several examples of alabaster and moonstone bowls, silk shades with artistic wood and metal fittings, and other lighting accessories are ready for demonstration. Other manufactures shown are "Laray" electric irons fitted with a switch connector; "Hogarth" radio apparatus; fires by Messrs. Sturge & Baker, Birmingham; "Nelson" three-filament valves; "Liberty" crystal sets, &c.; and many other electrical products.

The Lyons Fair.—The next Lyons Fair will be held from March 2nd to 15th, 1925, and it will contain exhibits from upwards of 20 different countries—especially those of the manufacturing countries of Western Europe. The Fair was attended by over 3,000 exhibitors this year, and it is expected that this number will be exceeded in 1925. Every known raw material and manufactured article can be bought at this Fair, and an advanced edition of the official catalogue, embracing about 90 per cent. of the total exhibitors for 1925 is being published. This catalogue has been completely translated into English, and is a valuable work of reference. It will be sent, post paid, to any address in the United Kingdom and the Colonies for 2s. 6d. The British representative of the Fair authorities is Mr. J. A. Victor, 77a, Queen Victoria Street, E.C.4.

Electrical Christmas Gifts.—In about three weeks' time Christmas will be here. Retailers of electrical appliances should therefore lose no time in securing all the help they can towards bringing the suitability of electrical Christmas gifts before the public notice. One form of assistance is the publicity matter provided by the British Electrical Development Association. The Association, in addition to its usual pamphlets, has produced an artistically coloured booklet illustrating several appliances which may be considered as suitable for Christmas presents, *e.g.*, a cooker, fan, vacuum cleaner, iron, kettle, &c. With each illustration are a few appropriate notes upon the advantages of the appliance.

Russian Notes.—*Telephone Works.*—The Industrial Planning Committee of the Supreme Council of National Economy has directed attention to the desirability of the concentration of the production of "weak-current" apparatus at fewer factories than is the case at the present time under the Weak Current Trust. In particular, it is mentioned that the Nischni-Novgorod telephone factory is only loaded to the extent of from 15 to 20 per cent. of its productive capacity.

Electric Traction.—The electrification scheme of the Commission of Railways comprises both the equipment of lines and of the transport workshops, a sum of from 30,000,000 to 40,000,000 roubles being required during the first five years. For 1924-25 an amount of only 4,400,000 roubles is required, but the railway budget merely provides a sum of 1,500,000 roubles for the current fiscal year, and the Commission has therefore applied for the allotment of 3,000,000 roubles from the electrical construction fund.

Sale Prices of Telephone Apparatus.—The State Planning Commission has been asked by the General Electrical Commission to revise the prices of "weak-current" apparatus supplied by the Telephone and Telegraph Trust to the State Railway Department on the ground that the existing contract prices result in losses. Having investigated the data put forward, the Planning Commission has acknowledged it to be necessary for the prices to be increased over the pre-war prices by the following co-efficients:—Telegraph apparatus, 1.45; telephone apparatus, 1.23; and measuring apparatus, 0.85.

The Manufacturing Trusts.—The directors of the Central Electrical Trust and the Leningrad Electrical Machine Trust recently held a joint meeting to consider the question of harmonising their activity. The competition between these trusts and the practice of concealing technical achievements from each other has called forth a demand for the amalgamation of both undertakings. As a result of the conference, it has been agreed to preserve the independence of each, while at the same time entering into a convention with the object of jointly serving the needs of industry and of works of electrification. It has been decided to effect an interchange of technical experience and to establish uniform prices for corresponding manufactures of the two trusts.

Foreign Capital for Works.—A representative of the Electro Exploitation recently presented a report to a meeting held in Moscow of the parties interested in the problem of the electrification of the districts of Serpykov and Podolsk, the report covering the results of inquiries abroad for credits for the realisation of the scheme. It was mentioned that this idea has met with full sympathy among big foreign electrical firms, especially in France, where the possibility was held out of the grant of credits for a period of not less than seven years. As a result of the negotiations concrete proposals are expected from foreign organisations who are interested in this scheme for the industrial regions in question, where the supply is to be procured from the Kashirsk station. It is now proposed to interrogate the industrial undertakings in the districts with a view to ascertaining the appropriateness of the re-equipment of the works for electrical power and the expenditure which would have to be made for this purpose.

Police Signal Systems for Norway.—An inquiry has been received from Norway for the names of United Kingdom manufacturers of modern police signal systems suitable for traffic control in large towns. Further particulars can be obtained by British manufacturers on application to the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1. (Reference C.X. 1,303.)

New Liverpool Showrooms.—The Corporation electricity department will shortly open premises in Whitechapel, Liverpool, where there will be a permanent exhibition of electrical domestic appliances.

Copper and Lead Prices.—Messrs. F. Smith & Co. report December 2nd:—Copper (electrolytic) bar, £69, £1 increase; do., do., sheets, no change; do., do., wire rods, £79, £1 increase; do., do., h.c. wire, 9 15/16d., 3/16d. increase.

Messrs. James and Shakespeare report December 2nd:—Copper bars (best selected), sheet and rod, £95, £1 increase; English pig lead, no change.

Lighting and Power Notes.

Argentina.—ELECTRICITY SCHEME.—In order to meet the increasing demand for electricity in Buenos Aires, the Société Hispano-Americain d'Electricité has recently placed orders in Switzerland for two 25,000-kW generating sets, and has also decided on the establishment of an additional steam-operated power station.

Australia.—NYMBOIDA HYDRO-ELECTRIC SCHEME.—The Nymboida hydro-electric undertaking was formally inaugurated by Sir George Fuller, Premier of New South Wales, on November 25th. Electricity is supplied to a number of towns on the Clarence river in northern New South Wales.

Birkdale.—PRICE REDUCTIONS.—The Birkdale District Electric Supply Co., Ltd., has introduced the following reduced charges for electricity supply:—Lighting: First 125 kWh per quarter, 7d. per kWh; all energy in excess of this amount, 6½d. per kWh. Power: 3½d. per kWh. Heating and cooking: First 500 kWh per quarter, 3d.; above this amount, 2d. per kWh.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—*The Financial Times* reports that the Shawinigan Water and Power Co. is installing plant on the Batiscan river at St. Narcisse, which will have a capacity of 20,000 h.p., with the possibility of being increased later to 30,000 h.p., and will cost about $1,500,000.

MONTREAL.—The City of Montreal contemplates the installation of a lighting system along the new waterworks aqueducts at a cost of $500,000.—*Reuter's Trade Service* (Montreal).

Chelmsford.—PROPOSED PURCHASE OF UNDERTAKING.—The Town Council, which proposes to purchase the local electricity undertaking of the Electric Supply Corporation, Ltd., has retained the services of Mr. A. H. Seabrook, consulting engineer, and has instructed him to submit a report on the proposal.

Continental.—SPAIN.—Our Special Correspondent reports that the Co-operativa Electrica de Langreo, which supplies electricity to mines in the Langreo region, is to extend its activities to the Mieres and Oviedo districts and supply electrical energy to the Asturian railways.

The question is being studied of unifying the Spanish electrical system, and plans are to be drawn up for obtaining the necessary funds.—*Reuter's Trade Service* (Madrid).

ITALY.—The Società Interregionale Cisalpina has recently completed the erection of a 130,000-V transmission line linking its Brugherio station, near Milan, with that at Reggio Emilia, a distance of 150 km. Work is now in progress on the extension of the line to Bologna, a distance of 210 km.

By the end of the year Italy will be connected from the Alps to Sicily by a distributing system to which most of the power stations will be able to furnish energy. A powerful group, financed by the Banca Commerciale, representing a capital of over 1,500 million lire, will supply electricity from the Adamello Co. in the Alps and the Terni Co. in Central Italy to the Sila in Calabria and the Generale Elettrica in Sicily. Another important combination, headed by the Edison Co. and including the Negri Co., with a combined capital of 1,000 million lire, is completing a hydro-electric system associating many power companies operating in Lombardy, Piedmont, Liguria and Emilia.—*Reuter's Trade Service* (Palermo).

FRANCE.—Steady progress is being made with the electrification of the rural districts of the department of the Seine Inférieure. Included in next year's development programme is the expenditure of 10,750,000 fr. for the electrification of 110 communes, towards which the department will contribute 2,700,000 fr.

THE TYROL.—A company has been formed in Bregenz, under the style of Vorarlberger Illwerke Gesellschaft and with a capital of two million Swiss francs, to establish a plant to utilise the water-power of the Upper Ill river and Lake Luner, near Piz-Buin, in the Vorarlberg. Several existing electricity supply undertakings are interested in the new enterprise. The electricity generated at the new plant is, it is stated, intended for "export" to Wurtemburg.

SWITZERLAND.—The Rheinfelden Kraftubertragungswerke, of Rheinfelden, which was one of the first hydro-electric plants on a large scale, recently celebrated the completion of the first thirty years of its existence. The company's hydro-electric plant has now a capacity of about 30,000 h.p., not including a reserve steam plant. Except for a small quantity consumed in the Canton of Aarau, practically the whole of the electricity generated is "exported" to South Germany.

Croydon.—PROPOSED ELECTRICITY EXTENSIONS.—The electrical engineer has submitted a report to the Corporation on the requirements of the electricity undertaking for the ensuing three years. For the winter of 1925-26 he recommends that additional plant be installed, including one 50,000-lb. boiler to replace boilers Nos. 12 and 13, at a cost of £38,287. To meet the requirements for 1926-27 he recommends that a 10,000-kW turbo-alternator, complete with auxiliaries, &c., be now ordered, at a cost of £46,000. The installation of further additional machinery is suggested at a cost of £36,000, but it is recommended that this should not be put in hand without further report.

Doncaster.—NEW PLANT.—Extensions to the Corporation electricity works were formally inaugurated on November 20th. The new plant includes a 1,250-kW rotary converter, two water-tube boilers with superheaters, mechanical stokers, &c. The total cost of the scheme was £113,000, and it was carried out to the plans and specifications of Mr. S. R. Windle, the borough electrical engineer.

Irish Free State.—THURLES (CO. TIPPERARY).—The Urban District Council's electricity undertaking was recently formally inaugurated.

Knaresborough.—ELECTRICITY SUPPLY.—In connection with the inauguration of the electricity supply referred to in our last issue, the whole of the scheme was carried out by the Western Electric Co., Ltd., who sub-let the contract for the switchboards, transformers, and kiosks to the Park Royal Engineering Co., Ltd. Electricity is obtained from the Harrogate Corporation at a pressure of 2,000 V, and distributed at 200 V a.c. single-phase.

Lanarkshire. — ELECTRICITY SUPPLY. — The Clyde Valley Electric Power Co. proposes to give a supply of electricity in Carluke and district.

Leicester.—INAUGURATION OF NEW PLANT.—The city of Leicester's new electricity generating station (see ELEC. REV., December 29th, 1922, and November 21st, 1924) was formally opened on November 26th, in the presence of a large company of members of the City Council and leading citizens. Councillor A. H. Swain (chairman of the Electricity Committee), who was supported by the Mayor (Councillor H. Simpson), received the guests, who were afforded ample opportunities of viewing the machinery, the main turbine set being set in motion by Mrs. Swain, while the house service set was started by Miss Smith, daughter of the engineer and manager, Mr. T. R. Smith, M.I.E.E.

At the luncheon, Councillor Swain presided, and among those present were Alderman Huntsman, chairman of the Nottingham Electricity Committee; Mr. V. Watlington, M.I.E.E., representing the English Electric Co., Ltd.; Mr. S. H. Webb, A.M.I.E.E., and many civic leaders.

Alderman Huntsman proposed the toast of the "Leicester Electricity Undertaking," and the Chairman, in reply, recalled that it was just thirty years since a similar inauguration took place, when the Gas and Electric Lighting Committee of Leicester undertook the lighting of the central portion of the city.

Mr. T. R. Smith, who also replied, after referring to the service given so freely by Alderman Huntsman, said Leicester had just cause for pride in its electricity undertaking, as within two years of the opening of its principal station with a 10,000-kilowatt set, the necessity arose for the additional plant which they had just started, due to the immense strides of local industries. He was satisfied that the ultimate capacity of 65,000 kW would be reached far sooner than most of them imagined. Since the city's showroom was opened in March last year they had installed nearly 600 electric cookers, 850 electric heaters, 300 kW of water-heating, and 100 kW of commercial cooking, while their files were stocked with orders. In proportion to the population, only one town in Great Britain appeared to have connected cookers at a greater rate per month than Leicester. The September applications of 1924 increased 75 per cent. over the corresponding month of last year.

Mr. Mawbey also replied, and Councillor J. Minto (vice-chairman of the Electricity Committee) proposed the health of the contractors, Mr. Watlington replying.

London.—ST. PANCRAS.—The Finance Committee has recommended to the Borough Council that application be made to the Electricity Commissioners for sanction to the borrowing of £50,000 for electricity purposes.

Manchester.—LOANS.—The Corporation has received the sanction of the Electricity Commissioners to the borrowing of £50,000 in respect of distributing stations, and is to apply for sanction to a further loan of £50,000 for mains.

Melton.—PROPOSED PURCHASE OF UNDERTAKING.—At a recent meeting of the Urban District Council, a report was submitted regarding the purchase of the Melton Electric Light Co.'s undertaking, in which it was recommended that an expert should be appointed to consider the proposal and advise the Council. After some discussion the matter was considered *in camera*. It is understood that expert advice is to be sought.

Mid-Lancashire Electricity Advisory Board.—A meeting of the Mid-Lancashire Electricity Advisory Board was held at Accrington on November 24th, at which schemes were considered for increasing the electricity supply, and proposals formulated to be submitted to the Electricity Commissioners.

New Zealand.—ELECTRICITY SCHEME.—The Waitomo Power Board has decided to take a poll on proposals to raise a loan of £90,000 for power development purposes. According to the *Industrial Australian and Mining Standard*, Messrs. Vickerman & Lancaster, consulting engineers to the Board, have submitted a report in which three schemes are proposed, the first costing £50,440, the second covering the same area and additions, £65,530, and a third comprising the whole system, at a cost of £78,000. It is also proposed to take over the Te Kuiti borough undertaking.

Oldham.—LOAN.—The Board of Guardians has decided to apply to the Minister of Health for sanction to the borrowing of £3,000 for the proposed electric lighting installation at the institution.

Paisley.—ELECTRICITY IN BULK.—The work in connection with the scheme for obtaining an electricity supply from Greenock has been completed, and a bulk supply was commenced last week. Kilmarnock is also being linked up with Greenock, and when the scheme is completed, either station will be in a position to supply Paisley.

Perth.—ELECTRICITY SUPPLY.—Electricity is being generated at the Stanley Mills near the city, and the Corporation, which has been offered a bulk supply, has asked the engineers for definite proposals.

Preesall.—ELECTRICITY SUPPLY.—The Urban District Council has entered into an agreement with the United Alkali Co. for a supply of electricity for the district for a period of 15 years.

Preston.—RIBBLE POWER STATION.—At the new Ribble power station, on November 20th, a satisfactory test was made of one of the new turbo-generator sets, coupled up with the Crown Street station. Slight adjustments will be required, however, before it will be considered safe to undertake the full service from the new station.

United States.—ELECTRICITY SCHEMES.—According to *Power*, the Pennsylvania Water & Power Co. has decided to use pulverised coal for firing boilers at its new steam plant at Holtwood, Pa., and a contract has been placed for a complete equipment for handling between 350 and 400 tons of coal per day. The new plant will adjoin the existing hydro-electric plant of the company. It is expected that this plant, which will cost about $3,500,000, will be put into operation in the spring of 1925. The ultimate capacity of the plant will be 100,000 kW with an initial installation of 20,000 kW.

Plans for the early construction of a steam generating plant to cost $3,000,000, at Avon, Ohio, have been announced to-day by Mr. F. L. Dame, president of the North American Co., which will finance the project through its subsidiary, the Cleveland Electric Illuminating Company. Forming a part of one of the Middle West's largest power systems, the new station, with a capacity of 400,000 h.p., will be linked with the company's Lake Shore plant in Cleveland. The combined power of the two plants, according to Mr. Dame, will exceed that now being obtained from the Niagara Falls.—*Reuter's Trade Service* (New York).

Warwickshire.—HOSPITAL ELECTRICITY SUPPLY.—The Visiting Committee of the County Mental Hospital has received from Mr. A. B. Mallison, of Salford, a report on the lighting and heating of the institution, in which he recommends that plant be installed for generating electricity for lighting, and that the exhaust steam be used for heating by means of central calorifiers. He states that electrical energy could be produced at less than 1d. per kWh. The estimated cost of the scheme is £40,000, and the committee has recommended to the County Council that it be proceeded with.

Weston-super-Mare.—PRICE REDUCTIONS.—The Weston-super-Mare & District Electric Supply Co., Ltd., has adopted the following reduced scale of electricity charges:—Lighting: First 50 kWh per quarter, 7½d. per kWh; next 50 kWh, 7d.; next 50 kWh, 6½d.; beyond, 6d. Heating and cooking: First 150 kWh per quarter, 2½d. per kWh; over 500 kWh, 2¼d.

Wick.—ELECTRICITY SUPPLY.—The Town Council has under consideration a report by a Glasgow engineer as to the cost of an electric lighting scheme for the town.

Willesden.—RECENT DEVELOPMENTS.—In addition to the conversion of street lamps already referred to, new installations during the current year have exceeded an average of 100 per month, or at the rate of 1,300 per annum, and over 1,500 consumers have been changed over from the old d.c. system to the a.c. 3-wire single-phase supply. The whole of this change-over has been effected without any section of the supply mains being "dead" for more than two or three hours, and generally the change was effected by an interruption lasting only a few minutes. Arrangements have been made by the addition of several new static sub-stations to change over about 2,000 more consumers now receiving a d.c. supply in the early part of next year.

Tramway and Railway Notes.

Bolton.—RAILLESS CARS.—At a recent meeting of the Town Council it was decided to promote a Parliamentary Bill in the next session empowering the Council to run railless cars within and without the borough.

Burnley.—PROPOSED NEW ROUTE.—The Corporation is seeking Parliamentary powers to construct a tramway along Gunsmith Lane to Brunshaw.

Colombia.—RAILWAY ELECTRIFICATION.—The Government is considering a proposal submitted by local promoters for the electrification of a number of railways in the State. A further proposal has been made to the municipality of Barranquilla to electrify its double line of street railways.—*Reuter's Trade Service* (Bogota).

Continental.—FRANCE.—The conversion of the Paris-Orleans line to electric traction will be taken in hand next spring. The track from Paris to Orleans will be relaid with 16-metre rails, and from Orleans to Montargis with 12-metre rails. It is also proposed to construct a line across France from Nantes to Strasburg, passing through Orleans, Montargis, Sens, &c. Surveys are now being made, and the works will be started within two or three years.

SWEDEN.—The Administration of the Saro railway, which is a suburban line of Gothenburg, has brought forward a scheme for the electrification of this railway, and has approached the Gothenburg Financial Committee with a view to the extension of the line to the end of the Sprangkullsgata, permission for which is a condition for the execution of the project.

SPAIN.—A new electric railway has been completed between Granada and Sierra Nevada, and will shortly be opened for traffic.

Our Special Correspondent informs us that the electrification of the railway between Tortosa and San Carlos de Rapita, in the province of Barcelona, is nearing completion, and tenders for the purchase of locomotives and other equipment are being prepared.

GERMANY.—A scheme is in hand for the electrification of the railway between Frankfort-on-Main and Basle, Switzerland.

Darlington. — STRIKE. — The Corporation tramways employés came out on strike on the morning of November 25th as a protest against the dismissal of a conductor and the relegation of two other employés. The men agreed to return to work in the afternoon, however, while the Tramways Committee discussed the matter. The Corporation's action was due to the decrease in repair work consequent upon the future adoption of railless cars.

Hipperholme.—The Urban District Council has granted to the Yorkshire (Woollen District) Electric Tramways, Ltd., licences for 15 motor-buses to ply for hire in the district.

India.—RAILWAY ELECTRIFICATION.—According to *Indian Engineering*, the electrification of the Bombay harbour line of the Great Indian Peninsula Railway Co. has now been completed, and will be brought into operation early next year; the inaugural ceremony will be performed by his Excellency the Governor of Bombay on February 2nd.

Manchester.—NEW ROUTES.—The Corporation has completed a further 8¼ miles of tramway track, which will be opened for traffic on December 7th.

Mexico.—RAILWAY ELECTRIFICATION.—The Mexican Railway Co. has announced that the electrification of the mountain section of its railway, between Orizaba and Maltrata, was recently completed, and a successful trial of an electric locomotive was made between Orizaba and Esperanza on November 30th.

Middlesbrough.—FARE STAGES.—The overlapping stages system introduced a few months ago was reported on at a recent meeting of the Tramways Committee. It was stated that for the three months ended October 30th, 927,000 passengers were carried, showing an increase of 110,000 in 1d. fares, and a decrease of 22,000 in 2d. fares. The Committee decided to make no alteration to the system.

Tynemouth.—PROPOSED UNDERGROUND RAILWAY.—Powers are being sought to incorporate a company for the purpose of constructing an underground railway between North Shields and South Shields, and to erect a generating station, with all necessary plant, &c.

Walsall.—RAILLESS CARS.—The Town Council proposes introducing in the next session of Parliament a Bill empowering it to substitute railless cars for the present tramway system.

West Hartlepool.—RAILLESS CARS.—The Tramways Committee has recommended the Town Council to adopt the railless-car system on the Park route, which is the shortest route in the town's system. Last February the Foggy Furze route was converted to the railless-car system, and has proved satisfactory.

Telegraph and Telephone Notes.

Canada.—NEW RADIO STATION.—The erection of the new Marconi radio station at Drummondville, Quebec, has been begun. One 300-ft. tower is now being erected, and 14 more are expected to be completed by the end of next year.—*Reuter* (Quebec).

Caroline Islands.—NEW RADIO STATION.—It is reported that the War Office has decided on the erection of a wireless station on Yap Island (in the west of the Caroline group) in accordance with the Japan-American Yap Agreement.—*Reuter* (Tokio).

Empire Communication.—PRESS DEPUTATION.—A deputation was received by the Pacific Cable Board on November 24th from the Empire Press Union to discuss the reduction of the rate for Press messages exchanged with Australia and New Zealand. The deputation was headed by Viscount Burnham, president of the Union. Reference was made to an assurance given by the Commonwealth Postmaster-General, Mr. Gibson, during his recent visit to London, that arrangements had been made for the reduction of the Press rate. It was represented that the facilities for the exchange of Empire news by cable were inadequate, and it was suggested that capacity for carrying additional Press traffic could be provided by a modification of the conditions of accepting week-end telegrams.

The chairman of the Pacific Cable Board, in reply, stated that the minutes of the meetings which were attended by Mr. Gibson proved that modification of the Press rate was at no time contemplated. The Pacific Cable was occupied to the limit of its capacity, and it would be impracticable to handle any additional traffic. Accordingly, further reductions of rates could not be made until the cable had been duplicated.

French West Africa.—NEW RADIO STATIONS.—Radio-telegraph stations were officially opened on November 27th, says *The Times*, at Bammako, in French West Africa, and Antananarivo, in Madagascar. They form part of the general scheme of communication between the various colonies of France.

International Telephony.—CONSULTATIVE COMMITTEE.—The permanent commission of the International Consultative Committee for Long-distance Telephony met last week in Paris. The sessions were presided over by M. Milon, director of the French telephone service; Colonel T. F. Purves represented Great Britain, and Belgium, Holland, Italy, Jugo-Slavia, Sweden, Switzerland, Czecho-Slovakia, Germany, and Austria also sent delegates. Delegates representing high-pressure electrical systems and the International Railway Union were asked to attend the conference, as among the questions under consideration was the problem of what means should be adopted to prevent disturbing influences on long-distance telephones. The conference also dealt with the drawing-up of estimates to serve as models for the supply of international telephone cables between the principal capitals of Europe and the furnishing of all the necessary accessories for such systems. The work of the Conference lasted a week.—*Reuter* (Paris).

Morocco.—NEW TELEPHONE LINE.—The new telephone company in Spain, which is under American management, is to lay a cable between Algeciras and Ceuta—which will probably be ready by the end of the year—so as to provide telephonic communication between Spain and Morocco, principally in the interests of the Spanish Government and the families of the officers and men serving in the protectorate.—*Reuter* (Madrid).

Portugal.—TELEPHONE RATES.—The Anglo-Portuguese Telephone Co. has obtained from the Government a decree which allows it to establish two rates of subscription for the telephone; the first by a fixed yearly sum, as at present, and the second by paying for calls. A distinction will be made between telephones in private houses and those in offices; both classes may now choose whether they will remain on the yearly system, or change on to the call system, but once they have changed, they are not at liberty to go back again to the yearly system.—*Reuter* (Lisbon).

Radio Telephony.—TRANSATLANTIC SERVICE?—It is reported that London will be in telephonic communication with America this time next year. Mr. G. H. Nash, of the Western Electric Co., Ltd., which is making all the apparatus, told the *Daily Express* that water-cooled 10,000-watt valves will be used and special plant will be installed at the Government station at Rugby for communicating with Rocky Point, Long Island, New York.

West Indies.—RADIO-TELEGRAPH RATE REDUCTION.—Marconi's Wireless Telegraph Co., Ltd., announced that on December 1st a new tariff came into force for messages between Great Britain and the West Indies, involving reductions of between 4d. and 6d. per word for places in the British West Indies, and between 9d. and 1s. 5d. per word for the French West Indies.

ALL-RED CABLE ROUTE.—A message addressed by the King to the Governors of Barbados, Trinidad, British Guiana, and the Leeward Islands was the first sent over the all-British cable route to the West Indies, on its opening on December 1st.—*Daily Telegraph.*

Radio Notes.

Germany.—NEW STATIONS.—Two new broadcasting stations are to be built at Cassel and Dresden. There are three already in operation in Hanover, Bremen, and Nürnberg.

High-Power Broadcasting.—EXTENSION OF FACILITIES.—The principle of alternative programmes is to be extended, and early in the New Year the high-powered station of the British Broadcasting Co. at Chelmsford (5 XX) will probably be removed to a position near Daventry, in Northamptonshire. Before the New Year two experiments are to be made in the provision, simultaneously, of programmes so contrasted as to appeal in some measure to all tastes. The high-powered station will broadcast three special programmes weekly, in development of the scheme of contrasted programmes.—*Daily Telegraph.*

Licensing.—AMATEUR'S DEFIANCE.—With reference to the note under the above heading in our issue of October 31st, we are informed by Mr. R. M. Ford (who, it will be recalled, had requested that he might be the first to be prosecuted for refusing to pay the ten-shilling licence fee for using a broadcast receiving set, and who called the Postmaster-General's powers of inspection and prosecution in question) that he has been notified that the Postmaster-General has no intention of exceeding his powers. Mr. Ford has therefore forwarded a subscription direct to the British Broadcasting Co. in recognition of its service upon condition that no part of the amount shall be applied to a Post Office or any licence, and the company has accepted the subscription upon this condition. Correspondence with the Postmaster-General, however, is being maintained with the object of preventing further official "threats and processes of intimidation" as unworthy of a Government Department and with a view to the possible return of the fees paid by "licence"-holders. Mr. R. M. Ford declares that his ultimate object is the "freeing from all taxes, licences, royalties (except by manufacturers to inventors), and other encumbrances of the simple crystal receiving circuit, while retaining under rigid and skilled control broadcasting and active transmission generally."

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW *in which the "Official Notice" appeared in our advertisement pages.)*

Open.

Argentina.—BUENOS AIRES.—May 27th. Department of Navigation and Ports. Semi-portal, portal and wall cranes, lifts, capstans and motors.*

Australia. — MELBOURNE. — January 13th. Postmaster-General's Department. Telephone indicators and induction coils and registers. January 20th. Condensers. January 21st. Automatic telephone switchboards. (November 28th.)

Belfast.—December 15th. Electricity Department. Steel framework for internal office building. (November 28th.)

Belgium.—December 10th. Belgian State Railway authorities at La Salle Madeleine, Brussels. A quantity of telephone cable and accessories at Ghent and Courtrai. Particulars (Cahier des Charges Special No. 3-79) for 9½ fr.

December 15th. Belgian Ministry of the Colonies (9th Division), at 10, Rue Brederode, Brussels. Three wireless telegraphy receiving and transmission sets for the Belgian Congo. Particulars on application to Cahier des Charges No. 949.

December 10th. Belgian Post and Telegraph authorities at La Salle Madeleine, Brussels. Five lots of bronze wire, comprising three lots of 40 kilometres each and two of 60 kilometres. Particulars on application to Cahier des Charges Special No. 3-81.

Birkenhead. — December 14th. Wirral Union. Rearrangement of the Well pumping plant, electric power plant, electric lighting, heating, hot-water supply and cooking plant. (See this issue.)

British Guiana.—GEORGETOWN.—January 17th. Sewage pumping plant, including electric generating plant, direct coupled to crude-oil engines, complete with switchgear, overhead transmission line, and 50 vertical-type electric motors and pumps. Specifications from Messrs. Howard Humphreys and Sons, 28, Victoria Street, S.W.

Castleford. — December 8th. Education Committee. Electric lighting installation at the secondary school. Specifications from Education Department, County Hall, Wakefield.

Croydon.—January 5th. Electricity Department. Four 500-kW converting plants, complete with semi-automatic starting equipment. (See this issue.)

Dewsbury.—December 10th. Corporation. Gas-driven electrical generating sets at the gasworks. Specifications and forms of tender from Mr. Henry L. Bateman, gas engineer and manager, Gas Works, Savile Town.

Dublin.—December 10th. Port and Docks Board. Twelve months' supply of stores, including electrical supplies. Mr. E. H. Bailey, secretary, Port and Dock Offices, Westmoreland Street, Dublin.

Durham.—December 5th. Board of Guardians. Electric lighting installation at the Institution, Crossgate. Particulars from Mr. H. E. Ferens, clerk to Board of Guardians, 25, Market Place.

Edinburgh.—December 8th. Tramways Department. 124 steel tramway poles and scrolls, &c. Manager, 2, St. James Square.

Egypt.—CAIRO.—December 22nd. Adjudication and Purchases Board. Two crude-oil engines, two air compressors, and auxiliary machinery for the power station, Tanta main drainage scheme. Specifications from the Adjudication and Purchases Board, P.W.M., or from the Main Drainage Department, P.W.M.

December 28th. Egyptian Ministry of the Interior (Municipalities and Local Commissions Section), Savoy House, Cairo. Supply and installation of the equipment for an electric power station and distribution system for the town of Mellawi.*

India. — CALCUTTA. — December 18th. Calcutta Electric Supply Corporation. One electrically-driven centrifugal pump (capacity 2½ million gallons per hour). The Secretary, Central Municipal Office.

London.—H.M. OFFICE OF WORKS.—December 8th. Electrical and mechanical engineering labour in day work in connection with the maintenance, &c., of installations in the Glasgow and Edinburgh districts for the period of three years from January 1st, 1925. Forms, &c., from Contracts Branch, H.M. Office of Works, London, S.W.1.

December 9th. Electrical accessories. (November 28th.)

ISLINGTON.—December 8th. Borough Council. Electric lighting installation at the Municipal Offices extension, Tyndale Place. (November 28th.)

January 16th. Electricity Department. Stores and materials for 12 months, including cables, meters, lamps, transformers, &c. (See this issue.)

LAMBETH.—December 9th. Board of Guardians. Twelve months' supply of incandescent electric lamps. (See this issue.)

METROPOLITAN ASYLUMS BOARD. December 31st. Electric lighting installation at Highwood Hospital for Children, Brentwood. (See this issue.)

Leeds. — Wiring, &c., for electric light installation at Beckett Street Poor Law Institution. Chorley & Gribbon, architects, 3, Park Place, Leeds.

Manchester. — December 23rd. Electricity Department. 3-phase, 6,600-V sub-station switchgear, and steel flues for air heater. (November 28th.)

Normanton.—December 22nd. Urban District Council. Wiring and fittings for the electric lighting of 100 houses. Particulars from the surveyor, Council Offices.

Portsmouth.—Electricity Department. Two 1,000-kW rotary converters, one 200-kW rotary converter, transformers, and e.h.p. and l.p. switchgear. (November 28th.)

December 10th. Board of Guardians. Electrical stores and lamps for three months. Mr. H. C. Morrell, clerk, St. Michael's Road.

Rochdale.—December 8th. Town Council. Electric lighting installation in the large hall and exchange at the Town Hall. Particulars and forms of tender from Borough Engineer, Town Hall.

Salford.—December 10th. Board of Guardians. Electric lighting installation and fire alarm scheme at the Infirmary. (November 28th.)

South Africa.—DURBAN.—Electricity Department. December 10th. Five e.h.p., 3-phase, draw-out type switch cubicles. Borough Electrical Engineer, Town Hall, Durban.

JOHANNESBURG.—January 3rd. Municipal Council. Transformers.*

(Continued on page 863.)

Henley's Research Laboratories.

A New Gravesend Organisation.

To Messrs. W. T. Henley's Telegraph Works Co., Ltd., research is no innovation, for the founder of the firm himself combined business acumen and research ability in a remarkable manner. Nowadays, however, prob-

Fig. 1.—New Research Building.

lems are much more complex, and industry recognises that organised investigational facilities enable results to be obtained more rapidly and with certainty. In the electric cable industry the field for industrial research may almost be characterised as limitless, and with the introduction of higher voltages demands for the utmost accuracy in manufacturing processes, combined with the investigation of the suitability of materials, have become insistent.

Accordingly special research laboratories, under the direction of Capt. P. Dunsheath, O.B.E., M.A., B.Sc., were established, being directly responsible to the company's general manager, but at the same time having an intimate relationship with every section of the Gravesend and Woolwich factories and the headquarters departments, such as buying, sales, &c. The activities of the research department are naturally divergent; much of the equipment is designed for testing raw materials, both to check the quality of those accepted, and to find new and improved ones. Considerable attention is also paid to process details; so far as

Fig. 2.—Power Plant and Switchboard.

is possible production is made a routine procedure, confining experimental work to the research department, another important function of which is the compilation of technical information from its own researches, and from published information for dissemination to other departments and for use in answering inquiries from customers.

Regarding fundamental research, the policy in choosing which problem to attack from the scores clamouring for attention is influenced by the utilitarian point of view. Results are wanted quickly and, while appreciating fully the value of academic research, the company considers it is rendering better service to its shareholders by tackling first those investigations which promise rapid reward in immediate practical application.

The laboratory building (fig. 1) is a two-storey structure with a total floor area of 14,000 sq. ft., and adequate artificial direct general illumination is obtained by means of 200-watt lamps in prismatic reflectors. The services are town's water, 60-lb. steam, town's gas, 15-lb. compressed air, vacuum, and high-pressure pumps. Electricity is brought in at 6,600 volts, the total used for all purposes being 350 kVA. By means of a rotary converter and a flexible arrangement of switchgear and circuits (fig. 2) the laboratories are supplied with 440-volt a.c. 3-phase and 110, 250, and 500-volt d.c. In addition, there is a 110-volt battery of 800 ampere-hours capacity, from which any

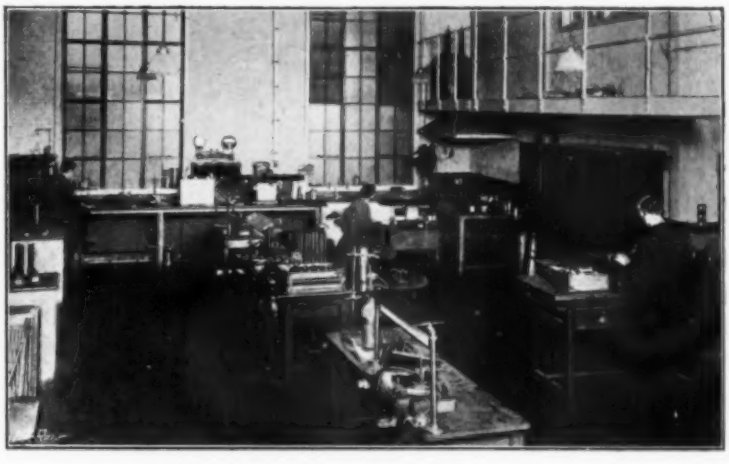


Fig. 3.—Low-voltage Laboratory.

voltage between 2 and 110 can be obtained in any room. The standard equipment of the low-pressure laboratory (fig. 3) includes a special d.r. testing set for oils and compounds (fig. 4). In the measurement of the conductivity of copper the difficulty of obtaining the correct dimensions of the raw material has led to the

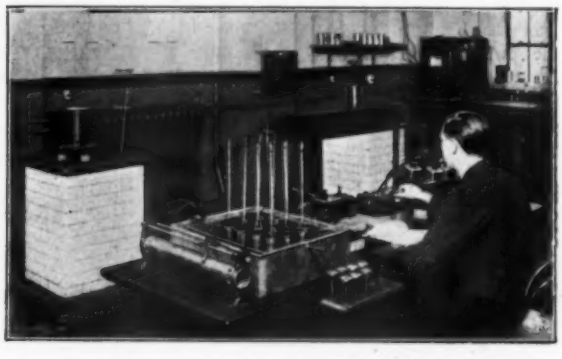


Fig. 4.—Impregnating Compound Testing Set.

adoption of a method suggested by the American Bureau of Standards, *i.e.*, the temperature coefficient only is measured, from which is deduced the conductivity. In this room is a primary 1,000-volt battery, also equip-

ment for the rating tests on switches and cut-outs, and for telephone cable testing.

For making special apparatus a workshop has been

Fig. 5.—Experimental Impregnating Plant.

provided, while one laboratory is set apart for works' processes on a small scale. As it is impracticable to duplicate the complicated plant of a cable factory even

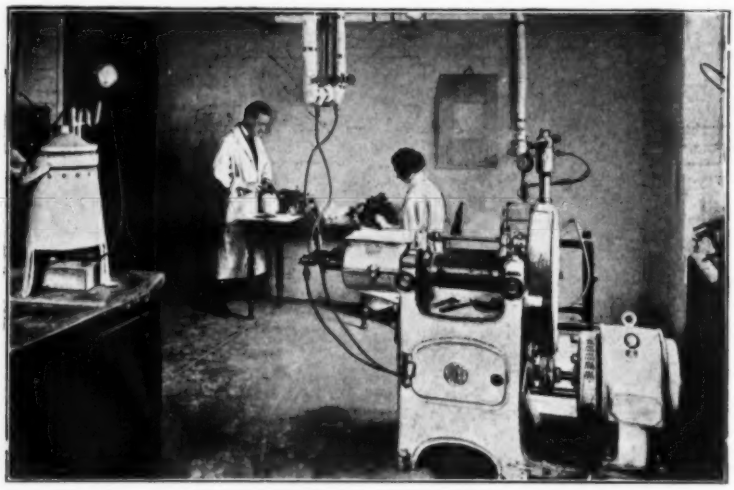


Fig. 6.—Experimental Rubber-making Plant.

on a small scale, the expedient of bringing machines into the process room for the particular investigation is adopted; on completion of the work they are replaced by others as required. Fig. 5 illustrates experimental impregnating plant, and a simple hydraulic tensile tester enables a longitudinal pull up to 100 tons to be applied to a sample of heavy strand on a piece of submarine cable.

Space does not permit of the description of the many machines and instruments installed. Microscopic and photographic equipment has led to some very useful observations, and the work carried out in the chemical laboratories (fig. 7) may be divided into acceptance tests on raw materials, control tests on materials during manufacture, and chemical estimations required for actual research investigations. In a small laboratory (fig. 6) rubber rolls, a daylight vulcaniser, and the necessary accessories enable experimental batches of rubber, or gutta-percha, test samples to be made under controlled conditions.

The high-pressure laboratory (fig. 8) occupies one end of the ground floor, and is equipped with modern plant for the measurement of dielectric losses and for the application of high-voltage tests to finished lengths of cable. A 225-kVA, 3-phase, 500-volt motor-alternator operating through three regulating transformers sup-

Fig. 7.—Part of the Chemical Laboratory.

plies the primaries of three 500/125,000-V, single-phase testing transformers; the latter are each insulated for 250,000 V to earth so that by suitable grouping a 3-phase test at 210,000, or a single-phase one at 375,000 volts, can be obtained. The voltage regulator of the h.p. transformers is automatic, the driving-motor being controlled by a series of push buttons in the instrument room; in carrying out a breakdown test, the actual rate of increase of voltage is of great importance, so that in designing the new plant it has been made possible to raise the voltage at any one of four different rates. The steel towers to be seen on the right of fig. 1 carry a transmission line which enables the high voltages generated in the laboratory to be applied for testing cables in the factory, push-button control being utilised; it also serves for testing porcelain insulators at high pressure. One of the most important rooms is the library, also used as a conference room, which is equipped with a projecting lantern and a screen for lecture purposes.

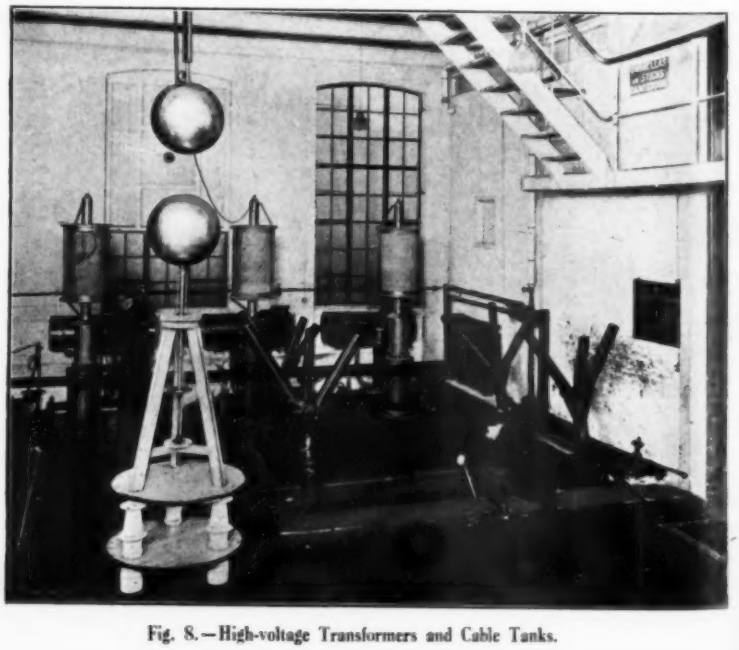


Fig. 8.—High-voltage Transformers and Cable Tanks.

The World's Largest Engineering Project.–I.*

The Undertaking of the Southern California Edison Co.

By T. B. ROSS.

In the solitude and banishment of the High Sierras of California, perhaps better known to strangers as the Sierra Nevada Mountains, the Southern California Edison Co. is engaged on a huge hydro-electric undertaking, which is claimed by the promoters and other Americans to be the largest engineering project of the world to-day, even exceeding in cost and magnitude of construction that great engineering achievement, the Panama Canal.

Fig. 1.—Huntington Lake, supplying water to Power House No. 1.

Originally started in a comparatively small way in the '90's by that big-visioned and hard-fighting pioneer, John B. Miller, who to-day still guides and directs the operations of the company as its president, the company, in those days known as the Edison Electric Co., gradually absorbed or amalgamated with the many small individual companies at that time operating in different parts of Southern California, and launched out about 12 years ago on the big project it now has in hand.

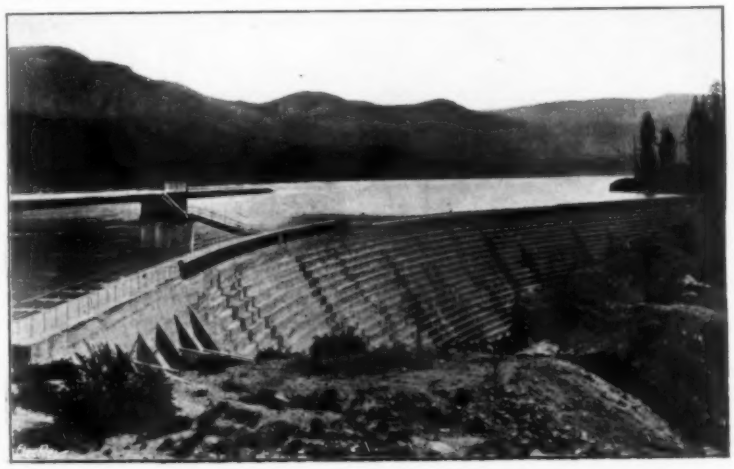


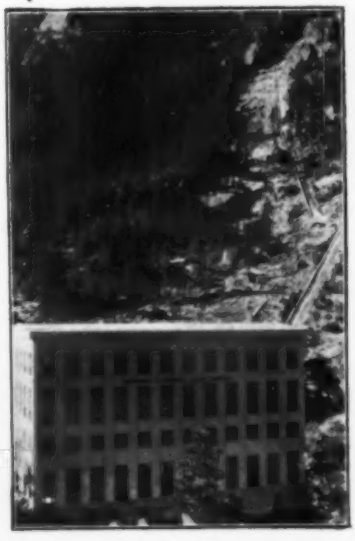
Fig. 2.—Dam No. 1 and Intake at Huntington Lake.

The writer of this and the succeeding articles, whilst visiting Los Angeles last year, heard so much about the Edison Co. and its operations in the mountains, that he decided to try to obtain an appointment with the company in one of its big construction camps for the purpose of studying the project, and to gain an insight into the methods of an American company operating on so large a scale. After waiting some weeks he was at last successful, and as a result spent all last winter in the headquarters camp at Big Creek, from which base the construction and development work of the company is conducted.

The company, in its vast undertaking, has set out to harness the great hydraulic forces appertaining to the numerous mountain lakes and streams feeding the well-known San Joaquin River, for the purpose of meeting the industrial and agricultural electricity demands of Central and Southern California. It is planned to complete the whole project by the year 1935, when the electrical requirements of a population of 6,000,000 people will be satisfied. At the present time, as a result of the work already completed, the company is supplying power and light to the people of Southern California, who number fully 1,500,000, distributed throughout the ten southern counties of the State and embracing the record-growing city of Los Angeles and its neighbouring smaller cities, and covering an area of 55,000 square miles.

Edison House, the main office of the company, is situated in the heart of the business section of Los Angeles, but from the engineer's point of view the organising and administrative work carried out from there is of less appeal than

Fig. 3.—View of Power House No. 1, in Camp 3, Big Creek, with "The Dome" above it.



Max. static head 2108 ft. (924 lb. pressure per sq. in.).
Fig. 4.—Power House No. 1 and Penstock.

* The author is indebted to the journal *Edison Partners* and other American sources for some of the particulars here given.

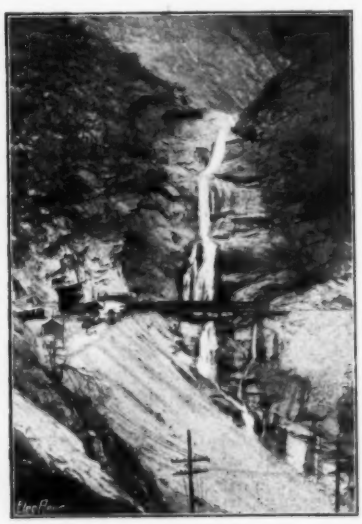
the actual work accomplished at the Big Creek and other mountain ranges distributed over a 30-mile front up in

Communication with Camp 3 only by dog sleighs in the winter.

Fig. 5.—Florence Lake Tunnel at the Farthest Camp in the Mountains (Camp 63).

the High Sierras, so the writer will take his readers on an imaginary visit to the camps. Leaving Los Angeles at 7.30 in the evening by the Southern Pacific Railway in a comfortable Pullman sleeper, we arrive about six o'clock the following morning at the town of Fresno, about midway between Los Angeles and San Francisco. Here we transfer to the San Joaquin and Eastern Railway, a standard gauge line run in conjunction with the Southern California Edison Co. to the mountainous country of the Sierras. Sufficient time is allowed for passengers to partake of breakfast before leaving Fresno, approximately 178 miles from Los Angeles, at an altitude of 295 feet above sea level. Traversing the San Joaquin valley through the large grape- and raisin-producing country, with its "Sunmaid" packing plants, we arrive at the station of Auberry, 45 miles distant, where one may say that the Edison field forces really begin to show up. At Auberry (2,050 ft. elevation) is the company's main distributing stores depôt, feeding the many construction camps in the distant mountains. Here will be noticed many of the company's employés, distinguished by the oval numbered tallies which all in the camps, from the resident engineer downwards, carry whilst in the employ of the company. Leaving Auberry, one can practically say good-bye to civilisation and city life. We are now about to penetrate into the wild country of the Sierras, where very stiff grades and sharp curves will be met with until we reach our journey's end, necessitating a change of locomotives to meet the conditions ahead. The drive-shaft engine is therefore replaced by a gear-type engine fitted with an upright drive which, although unable to produce a speed of more than 15 miles per hour, has the advantage of enormous pulling power, more than sufficient to overcome the maximum grade of 5½ per cent. These gear-drive engines have been nicknamed the "galloping geese"—a name which well describes their strenuous, noisy, and excitable efforts to "beat the grade."

But to continue our journey: having left the Auberry camp behind, after climbing a further 994 feet over a distance of 11 miles through the most delightful mountain scenery, another stop is made at the small depôt named Hairpin, at which will be found a cable tramway 6,400 ft. in length, specially erected to handle the material and equipment required when constructing the large power house (No. 3) and plant operating down below on the main stream of the San Joaquin River. The cable in use on this tramway is claimed to be the longest in the world. From Hairpin to Cascada, 18½ miles further on—the terminal depôt of the line and the point of our destination—the train grinds its laborious way through a somewhat desolate and undeveloped country, negotiating such stiff ascents and curves that one gets the impression that it is trying to tie itself up in knots, which no doubt would be the ambition of such a stupid bird as a "galloping goose." However, all goes well, and we arrive at Cascada as the afternoon sun is beginning to sink beyond the mountain peaks of the Kaiser Pass. We are now in Big Creek Camp, at an altitude of 4,881 ft. above sea level, where we get the first "close-up" view of the company's power house No. 1. (See figs. 3 and 4.) The camp is divided from the town of Cascada by the company's incline railway, used during the snow-clear months, from April to September, to convey stores and equipment to another



These falls greatly increase in volume when the snow is melting on the mountains.

Fig. 6.—Stevenson Creek Falls, close to Big Creek Camp.

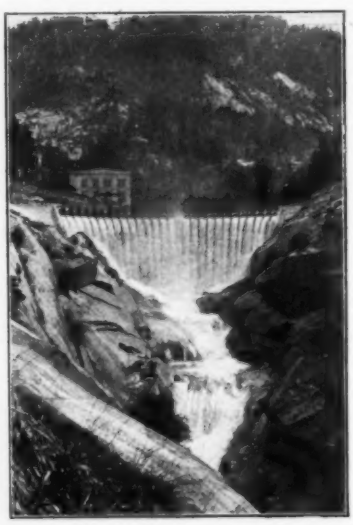
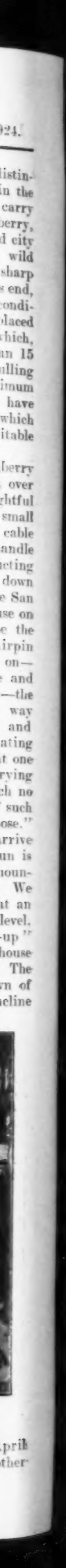


Fig. 7.—Power House No. 1 and Dam No. 4, from which water is taken to a Power House below.

Fig. 8.—Dam No. 2 under Construction.



distributing depôt some 2,000 ft. or more above Big Creek, which serves the outlying camps in the distant mountains.

In Big Creek camp will be found the resident engineer's offices, drawing office, employment and accounting departments, big store warehouses and bays, timber and metal yards, oil storage tanks, engineers' and carpenters' workshops, a planing and saw mill, a huge dining room capable of seating 500 or more people simultaneously, a recreation room for the men in camp, besides dozens of wooden frame-bungalows, bunk-houses, and shacks, providing sleeping accommodation for probably 2,000 workers. As in most construction camps, whatever space is available has to be made use of, and consequently the various buildings in the camp are scattered about wherever flat plots of land can be found.

To continue our journey beyond Big Creek, it is necessary to resort to automobiles or motor trucks over the new mountain roads which have been built by the company as its operations extended. Making a run of 5½ miles over the steep and winding road to Huntington Lake, we arrive at dam No. 1; this impounds the water supply from the lake to power house No. 1 in Big Creek, which lies almost directly below us. Here the elevation is 7,000 ft., and the water flowing through the 6,000-ft. long penstock to the turbines below gives a static head of 2,131 ft., with a present capacity of 64,300 h.p., which will be increased to 86,000 h.p. when power house No. 1 is completed.

Huntington Lake was at one time simply a mountain meadow, but the Edison Co. has transformed it into a storage reservoir by the erection of three dams, giving it a capacity of 88,000 acre-ft. (See fig. 1.) Dam No. 1, previously referred to, is 173 ft. high and measures 1,735 ft. in length along the top. This and the other two dams were built in 1913, but four years later they were all raised an additional 35 ft. From the accompanying illustration (fig. 2), showing No. 1 dam and intake, will be seen the type of construction employed. Passing on from this end of Huntington Lake and following the road on the west side for a distance of about nine miles, we arrive at the far end of the lake, where is to be seen the south portal (fig. 5) of the tunnel, 13½ miles long, joining Huntington Lake to Florence Lake (elevation 7,300 ft.). This Florence Lake tunnel, started in 1920, is expected to be completed by the spring of 1926. It has a cross section of 15 ft. by 15 ft., and will have a capacity of 1,000 cu. ft. per sec. Other tunnels, of varying lengths and cross sections, are at present under construction, or shortly to be started, and altogether 86 miles of these diverting waterways through the solid granite mountains will have been built by the time the Big Creek project is completed. To facilitate the drilling and boring of these tunnels, lateral headings, known as "adits," are introduced between the two ends of the tunnel, which enable additional gangs of drillers, muckers, &c., to concentrate on their particular sections and also live closer to their work. The average rate of drilling and clearing is, it is said, in the vicinity of 12½ ft. per heading per day, but 25 ft. maximum has been driven in a full working day of three eight-hour shifts.

(To be concluded.)

Contracts Open.

(Continued from page 858.)

Stockton-on-Tees.—December 8th. Electricity Department. Paper-insulated cables, a.c. meters, and house service cut-outs. (November 28th.)

Sweden.—STOCKHOLM.—Free Harbour Committee. Portal cranes, capstans, &c.*

Switzerland.—December 31st. The Swiss Federal Railway authorities (General Direktion, Schweizer, Bundesbahnen) in **Berne.** Plant for the Rupperswil transformer station: three single-phase 11,000-kVA transformers, switching installation, including both 132- and 66-kV apparatus, measuring instruments, &c., and station service equipment, including two 100-kVA transformers, two 20-kW transformers and switchboard. Similar equipment for the Kerzers transformer station and for the transformer station at Puidoux as that for Rupperswil, except station equipment. Copies of the specification and drawings may be obtained from the Abtheiling für Elektrification, Bureau 166, Dienst Gebaude, 45, Mittelstrasse, Berne (15 fr.).

Torquay.—Electricity Department. Two 25,000-lb. per hour water-tube boilers with chain grate stokers, elevator, conveyor, bunkers, &c. (November 28th.)

Uruguay.—MONTE VIDEO.—December 30th. State Electric Works. Four air compressors.*

STATE ELECTRICITY WORKS.—December 29th. Five distribution switchboard complete, and one power station generator panel equipment.*

Wigan.—December 18th. Sewage Disposal Committee. Three sets of electrically-driven pumps at the sewage works. Mr. R. B. Donald, borough engineer.

Wimbledon.—January 1st. Electricity Department. One water-tube boiler, superheater, economiser, soot blowers, mechanical stokers, coal elevator and bunker, draught plant, steel chimney and the necessary foundations. (November 28th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Aberdeen.—Tramways Committee. Accepted:—
Ten tramway cars, £1,939 14s. each (£19,397).—British Thomson-Houston Co., Ltd.

Australia.—SYDNEY.—Electricity Supply Committee. Recommended:—
85 lead-lined battery boxes (£1,266).—C. O'Brien.
135-b.h.p., 415-V, a.c. motor (£237).—Noyes Bros. (Sydney), Ltd.
L.p. underground cables (£27,839).—W. T. Henley's Telegraph Works Co., Ltd.
Lamp contract and suspension gear (£778).—Lawrence & Hanson Electric Co., Ltd.

Municipal Council. Accepted:—
100,000 "Osram" lamps.—General Electric Co., Ltd.

MELBOURNE.—Victorian Railways. Accepted:—
Copper contact wire (£2,656).—British Insulated & Helsby Cables, Ltd.
Spare parts for motor and generator (£435).—Metropolitan-Vickers Electrical Co., Ltd.
Three sets of lighting equipment (£495).—M. Coates & Co. Pty., Ltd.

Electric Supply Committee. Recommended:—
Electricity meters.—W. G. Watson & Co., Ltd. (£2,152), Landis & Gyr, Ltd. (£676).

QUEENSLAND.—Rockhampton City Council.
Transformers, switchgear, and transmission lines in connection with the Yaamba scheme (£21,500).—Australian General Electric Co., Ltd.
—*Tenders.*

SOUTH AUSTRALIA.—ADELAIDE. Supply and Tender Board. Accepted:—
Fifty-two 3-phase electric motors for the locomotive workshops, Islington (£4,680).—Metropolitan-Vickers Electrical Co., Ltd.

TASMANIA.—Launceston City Council.
5,500 240-V lamps (£269).—W. & G. Genders.
300 ditto (£310).—British General Electric Co., Ltd.
800-kVA transformers and two auto transformers, with indicators (£22,268).—English Electric Co., Ltd.
—*Tenders.*

Ayrshire.—Education Committee. Accepted:—
Installing electric light at Carrick Academy, Maybole (£318).—C. Ogilvie.

Belgium.—International competition was experienced in Brussels last week for the Belgian State Railway authorities' contracts for the supply of about 50 lots of miscellaneous material required for the signalling section of the electrified railways. Callender's Cable and Construction Co., Ltd., of London, competed for one of the lots—for 220 kilometres of insulated conductor, 1 kilometre of hammered copper wire, and 2 kilometres of flexible wire—but the lowest tender was that of the Société des Ateliers de Constructions Electriques de Charleroi.

Dublin.—County Borough Commissioners.
Wiring and capping and casing of 231 houses on the Marino housing area:—

	Wire (400-100 yd. coils).	Capping and Casing (41,000 ft.).
Ateliers de Constructions Electriques de Charleroi	**£107**	—
Deutsche Kabelwerke, Akt-Ges.	178	—
Chapman & Chapman	190	£199
Alternative	—	215
British Thomson-Houston Co., Ltd.	430	158
General Electric Co., Ltd	**425**	**130**
Edison Swan Electric Co., Ltd	425	190
Roper Bros.	425	200
British Insulated & Helsby Cables, Ltd.	425	241
Metro-Vick Supplies, Ltd.	425	266
Alternative	—	266
W. T. Henley's Telegraph Works Co., Ltd.	425	—
W. T. Glover & Co., Ltd.	425	—
Siemens Bros. & Co., Ltd.	435	—

The lowest tender in each case, that of the Ateliers de Constructions Electriques de Charleroi for the wire, and that of the General Electric Co., Ltd., for the capping and casing, have been accepted.

The Commissioners have extended the agreement with the General Electric Co., Ltd., for the maintenance of the electricity meters for the coming 12 months at £700 per annum.—*Irish Builder and Engineer.*

Dundee.—Electricity Committee. Accepted:—
Switchgear for Caroline Port (£17,379).—British Thomson-Houston Co., Ltd.
Reinforced concrete piling and foundation work for the circulation water supply extension (£2,336).—Yorkshire Hennebique Co.

Glasgow.—Tramways Committee. Recommended:—
Commutators.—Dyer & Young, Ltd.
Partial brake equipments.—Metropolitan-Vickers Electrical Co., Ltd.
Brass tubing for canopy rods.—Leslie & Hall, Ltd.
Points and crossings.—Titan Track Work Co., Ltd.
Trolley wire.—British Insulated & Helsby Cables, Ltd.
Poles.—Stewarts & Lloyds, Ltd.

India.—BOMBAY.—Bombay, Baroda and Central India Railway.
17,500 "Osram" gasfilled lamps.—General Electric Co., Ltd.

East India Railway Co.
8,000 "Osram" lamps.—General Electric Co., Ltd.

Lancaster.—Electricity Committee. Accepted:—
Alterations to 2,000-kW turbo-generator, with switchgear and cable (£1,085).—Metropolitan-Vickers Electrical Co., Ltd.

London.—LEWISHAM, S.E.—Board of Guardians. Accepted:—
Extension of Lewisham Hospital, including power house, &c. (£131,380).—A. Monk, Lower Edmonton.

HOLBORN.—Board of Guardians.—Electric lighting installation at the City Road Institution, Shepherdess Walk, N.1.

Electrical Installations, Ltd. (Accepted.)	**2,307**
Ellis & Ward, Ltd.	2,421
G. N. Haden & Sons, Ltd.	2,728
Troughton & Young	2,800
Pinching & Walton	2,841
F. Polden & Co., Ltd.	2,888
Tyler & Freeman	3,160
A. Dean & Co., Ltd.	3,230
W. H. Gaze & Sons, Ltd.	3,425
Mann, Egerton & Co., Ltd.	3,446
D. Winkworth	4,850
Guild of Engineers (London), Ltd.	5,397

Manchester.—Electricity Committee. Accepted:—
10-ton electric crane and gantry.—Higginbottom & Mannock, Ltd.
10-ton hand crane.—Vaughan Crane Co., Ltd.

New Zealand.—WELLINGTON.—Public Works Department. Accepted:—
Lake Coleridge hydro-electric scheme:—
Turbines (£11,762).—Vickers (N.Z.), Ltd.
Generators (£18,706).—J. J. Niven & Co. (Bruce Peebles).
Pipe lines (£37,468).—Anderson, Ltd.
Waikato scheme:—
4/500-kVA transformers (£2,721).—J. J. Niven & Co.
4,250-kVA ditto (£1,810).—Turnbull & Jones, Ltd.
AUCKLAND.—Auckland Electric Power Board.
One 2,000-kW rotary converter.—British Thomson-Houston Co., Ltd.—*Tenders.*

Salford.—Watch Committee. Accepted:—
126 "Wootton" lanterns, complete with accumulator and 2 bulbs, and 3 charging boards (£232).—S. Smith & Sons (Motor Accessories), Ltd.

Wigan.—Corporation. Accepted:—
Four centre entrance, single deck, Straker-Clough trolley omnibuses.—Clough, Smith & Co., Ltd.

Forthcoming Events.

Northampton Polytechnic Institute.—Friday, December 5th. At St. John Street, E.C. At 7 p.m. Annual prize distribution.
Saturday, December 6th. From 6.30 p.m. to 10.30 p.m. Annual conversazione.

Institution of Mechanical Engineers.—Friday, December 5th. At the Institution, Storey's Gate, S.W. Papers, "The Effect of Low and High Temperatures on Materials," by Prof. F. C. Lea, and "The Elastic Limit in Tension and its Influence on the Breakdown by Fatigue," by Mr. J. M. Lessells.

Salford Technical and Engineering Association.—Saturday, December 6th. At 2.30 p.m. Visit to the Agecroft power station. 6.30 p.m. Annual general meeting.

Nottingham Society of Engineers.—Monday, December 8th. At the Victoria Station Hotel. At 7.30 p.m. Annual dinner.

Institution of Electrical Engineers.—INFORMAL MEETINGS.—Monday, December 8th. At the Institution, Victoria Embankment, W.C. At 7 p.m. Lecture, "A Walk Round the Pretoria Power Station," by Mr. G. M. Clark.

(North-Midland Centre).—Tuesday, December 9th. At the Hotel Metropole, Leeds. At 7 p.m. Paper on "Power Circuit Interference with Telegraphs and Telephones," by Mr. S. C. Bartholomew.

(Dundee Sub-Centre).—Thursday, December 11th. At University College, Dundee. At 7.30 p.m. Paper on "Industrial Power Supply: A Comparison of Electrical and Other Methods of Driving Industrial Machinery," by Messrs. A. G. Norris and W. H. T. Swire.

(Irish Centre, Dublin).—Thursday, December 11th. At Trinity College, Dublin. At 7.45 p.m. Ordinary meeting.

(Scottish Centre).—Tuesday, December 9th. At 207, Bath Street, Glasgow. At 7.30 p.m. Paper on "An Electric Harmonic Analyser," by Prof. Miles Walker.

(North-Eastern Centre).—Monday, December 8th. At Armstrong College, Newcastle-on-Tyne. At 7.15 p.m. Lecture on "The Gyroscopic Pendulum," by Prof. J. G. Gray.

(East-Midland Sub-Centre).—Tuesday, December 9th. At the Town Hall, Leicester. At 6.45 p.m. Paper on "Domestic Applications of Electricity," by Mr. T. Hall.

(London Students' Section).—Friday, December 12th. At the Institution, Victoria Embankment, W.C. At 6.15 p.m. Paper on "Crane Controllers," by Mr. H. Hvistendahl.

(North-Western Centre, Students' Section).—Thursday, December 11th. At the Engineers' Club, Manchester. At 7.15 p.m. Joint debate with the N.-W. Students' Centre of the Institution of Mechanical Engineers on "That in Preparing for His Career the Young Engineer has to [illegible] Unnecessary Amount of Ground."

(Scottish Students' Section).—Friday, December 12th. At the Glasgow Technical College. At 7.30 p.m. Paper on "The Early Development of the Direct-current Dynamo and Motor," by Mr. B. Hague.

(Sheffield Students' Section).—Wednesday, December 10th. At the University. Paper on "Super-Conductivity," by Mr. G. Lindley.

Society of Engineers.—Monday, December 8th. At 17, Victoria Street, S.W. At 6 p.m. Annual general meeting.

National Association of Supervising Electricians.—Tuesday, December 9th. At St. Bride's Institute, E.C.4. At 7.15 p.m. Paper on "Common Mistakes in the Application of Electric Motors," by Mr. T. H. Windibank.

Batti-Wallahs' Society.—Wednesday, December 10th. At the Hotel Cecil. At 1 p.m. Luncheon. Chief guest, Admiral Sir R. B. Dixon, Director of Engineering, Admiralty.

Institution of Engineers-in-Charge.—Wednesday, December 10th. At St. Bride's Institute, Bride Lane, E.C. At 7.30 p.m. Presidential address (Mr. T. Cooper) on "Responsibilities and Training of the Engineer-in-Charge."

Royal Society of Arts.—Thursday, December 11th. At John Street, Adelphi, W.C. At 8 p.m. Chairman's (Senatore G. Marconi) address on "Radio Communications."

Electrical Power Engineers' Association (Manchester Section).—Thursday, December 11th. At the Geographical Hall, Deansgate, Manchester. At 7.15 p.m. Lecture on "The Impulse Steam Turbine," by Mr. S. M. S. Sichel.

Institution of Civil Engineers.—Thursday, December 11th. At Great George Street, S.W. At 6 p.m. Discussion on "Standards of Comparison in Connection with the Thermal Efficiency of Steam Engines," to be opened by Capt. H. Riall Sankey, C.B.

Edinburgh Electrical Society.—Friday, December 12th. At the Philosophical Institute, 4, Queen Street. At 8 p.m. Paper on "Small Isolated Plants," by Mr. J. G. Burchell.

Junior Institution of Engineers.—Friday, December 12th. At 39, Victoria Street, S.W. At 7.30 p.m. Paper on "Fluid Transmission," by Mr. H. G. Bouly.

Manchester Association of Engineers.—Friday, December 12th. At the Manchester Art Gallery. President's conversazione.

Physical Society of London.—Friday, December 12th. At the Imperial College of Science, South Kensington, S.W. At 5 p.m. Ordinary Scientific Meeting.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of:—
TRIPLEX lighting fittings.
THERMOLITE Flushers.

Notes.

The Ferrantians.—The date for the next re-union of old Ferrantians has been fixed for Wednesday, December 17th, at the Hotel Cecil, London. Dr. S. Z. de Ferranti will be the guest of the evening, and the chair will be taken by Mr. H. W. Kolle. It was originally announced that Mr. C. H. Wordingham, C.B.E., would preside, but owing to his illness this will unfortunately not be possible. There has been a considerable response from Ferrantians in all parts of the country, but it is hoped that others also will communicate with the hon. secretary, Mr. W. E. Warrilow, 40, Mildred Avenue, Watford.

A Gas Fire and After.—Considerable damage was caused by a fire which occurred on November 17th in the ancient parish church of Ashford, Kent. A report in the *Tuesday Express*, a local paper, states that the origin of the fire was found to be a gas meter in a cupboard, and the main stopcock was also in the cupboard which made it impossible to cut off the supply until the flames had been extinguished. The *Tuesday Express* learns that as a consequence of the conflagration electricity is to be used in the near future for lighting and organ-blowing, and thus good will come out of evil.

The Decimal Association.—The annual meeting of this Association, presided over by Sir Richard Gregory, was held on November 26th at Stationers' Hall. In his address the President called attention to the spread of the metric system throughout the world, the latest adherents being Japan, Siam and Russia. Reports from these countries showed that the change was making rapid progress. Sir Richard Gregory further pointed out that any nation which had altered its weights and measures had always chosen the metric system in spite of the preponderance of British trade. The annual report submitted by Mr. Stubbs, in the absence of Mr. McKenna through illness, showed great progress in propaganda methods evidenced by the holding of the successful Decimal-Metric Congress in July and the lectures which have been held at 28 different centres throughout the country. Sir Stephen Killik, and Messrs. Felix Blakemore, Philip Lockhart and Bryan Pontifex have been elected to the Executive Committee. New vice-presidents are Sir Hedley le Bas and Messrs. Llewelyn Atkinson, Harold Cox and Gordon Selfridge.

American Electroplating Conference.—A conference on electroplating has just been held at the United States Bureau of Standards in Washington, to which all platers, chemists, superintendents or factory officials, dealers in platers' supplies, and others interested in electroplating were invited. The conference dealt with research work.

The City Massage Clinic.—We are asked to inform our readers that the St. Dunstan's Massage Clinic which was established at 18, Christopher Street, Finsbury, E.C., has been removed to a more central position for the treatment of patients at 23 and 24, Wormwood Street, Old Broad Street, E.C., where new and more up-to-date apparatus has been installed for massage and electro-medical purposes. The clinic is manned by officers and men who were blinded in the war and were subsequently trained at St. Dunstan's. All of them passed the severe examination admitting them to membership of the Chartered Society of Massage and Medical Gymnastics.

Cleaner Air.—How to provide more healthy conditions in our buildings was dealt with in a paper on "Air Washers and Air Filters," by Mr. H. W. S. Martin, at a meeting of the Institution of Heating and Ventilating Engineers, at the Engineers' Club, London. Mr. Martin stated that in any of our large towns the necessity for washing and filtering the air to cleanse it and remove the soot and smoke before passing it into a public building was fully recognised. The smoke, of course, should never be allowed to be put into the air, but the great harm done by this pollution was not yet generally realised.

'Buses at West Hartlepool.—Mr. H. Fisher, of the Ministry of Transport, attended West Hartlepool on November 17th for the purpose of hearing an appeal by the Hartlepool Motor Service against the refusal of the West Hartlepool Corporation to grant licences for the running of motor 'buses between West Hartlepool and Hartlepool, part of the route being in the West Hartlepool area. The Town Clerk of Hartlepool, who presented the appellants' case, said that the Hartlepool Corporation was in no way concerned in the application for the licences, but the through route was used mainly by Hartlepool people and there were many complaints about the present inconvenience. Since the application, the West Hartlepool Corporation had issued notices of its intention to apply for a Provisional Order to empower it to run trolley 'buses, and the Hartlepool Corporation had decided to promote a Bill for authority to run motor 'buses inside and outside the borough.

Mr. W. J. Coates said that the only reason why the application was refused was because of traffic congestion and the sufficiency of the present means of transport. The Town Clerk of West Hartlepool submitted that the West Hartlepool Corporation and Tramways Company had certain rights, but Hartlepool had no rights and should be the last to be considered in this matter.

The Inspector said that he could not promise an early decision until more definite information was available regarding the Hartlepool Corporation's Bill.

Conductors for Overhead Power Transmission.—The data in B.E.S.A. publication No. 125-1924, "Hard-drawn Copper Solid and Stranded Circular Conductors for Overhead Power Transmission Purposes," are based on the results of extensive tests on hard-drawn copper conductors carried out by the British Electrical and Allied Industries Research Association and also by the National Physical Laboratory, and are the first authoritative data to be published in this country on hard-drawn copper conductors. Four tables are included in the specification, two of these dealing with solid (single) conductors and two with stranded conductors. In each case two series of standard sizes are given, a primary series for use whenever possible, and a secondary series for use when it is impracticable to use the primary sizes. The Committee responsible for this specification has adopted these two series of sizes in the hope that the secondary sizes will eventually fall into disuse. Mechanical and electrical tests are specified for all sizes, as are also the weights per 1,000 yd. and per mile. This Specification is of special importance in view of the Regulations for Overhead Lines prescribed by the Electricity Commissioners, wherein it is stated that "all line conductors at the time of erection shall comply, as regards elongation, breaking load and elasticity, with the Specification of the British Engineering Standards Association then in force." Copies of the publication may be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, S.W.1, price 1s. 2d. post free.

Newcastle-on-Tyne Electro-Harmonic Society.—Newcastle is the latest city to have its Electro-Harmonic Society. The Society held its second smoking concert on Monday evening last, December 1st, at the Collingwood Restaurant. There will be at least two more concerts this season. Admission last Monday was free, but during the interval members were enrolled, the subscriptions being 7s. 6d. for members and 2s 6d. for associate members. The artistes were:—Mr. Wymark's Quartette Party; Mr. Winnard's String Quartette; Mr. Geo. Hodgson (tenor); Mr. W. J. Starkey (solo banjo); Mr. Sam Sykes (entertainer); and Mr. Sidney Jewell (baritone). The hon. musical director, Mr. J. G. Adamson, was the accompanist. Mr. H. D. W. Earnshaw, of 6, Elswick Court, Northumberland Street, Newcastle-on-Tyne, is the honorary secretary, and Mr. E. E. Shatford, the hon. treasurer. We wish the new Society every possible success.

Inventions Commission.—Mrs. Ayrton Gould, daughter of the late Prof. Ayrton, appeared before the Royal Commission on Awards to Inventors in London on November 24th in support of a claim, as executrix of her mother, in respect of searchlight carbons used by the Admiralty during the war. In 1908, she said, her mother conducted investigations with electric arc lights, as a result of which she produced a carbon which gave a perfectly steady arc and was very suitable for searchlight use. During the war the Admiralty searchlight carbons were supplied by the General Electric Co., Ltd., and from investigations made by her mother they were found to be her type of carbon, although not bearing her patent mark. The Commission is to consider its decision.

The Engineers' Club, London.—Amongst the fifteen societies meeting at the club this month are included the Chief Technical Assistants' Association, the Associated Municipal Electrical Engineers, and the Mining Electrical Engineers.

Appointments Vacant. — Assistant electrical engineer (£350) for the Epsom Urban District Council. Assistant to the Engineer and Manager for the Leatherhead & District Electricity Supply Co., Ltd. Plumber-jointer for the Ealing Borough Council Electricity Supply Department. Draughtsman for the Stepney Borough Council electricity undertaking. Cooking demonstrator and showroom attendant for the Cardiff Corporation Electricity Department. Mains assistant for the Great Yarmouth Electricity Department. (See our advertisement pages to-day.)

Progress in Illuminating Engineering.—At the opening meeting of the Illuminating Engineering Society, on November 18th, it was announced that Mr. Chas. H. Wordingham had consented to accept the presidency for the current session. Mr. Gaster, in an opening address, said that the vacation had been a period of exceptional activity.

Following Mr. Gaster's address, the report of the Committee on Progress in Electric Lamps and Lighting Appliances was presented by Mr. C. Hughes. The report records further progress towards higher values of illumination, the use of portable illumination photometers having proved helpful in this direction. The new "all-white" gasfilled lamps have proved very popular, and the sales of colour-sprayed lamps have considerably increased. An important step has been the issue of the B.E.S.A. specification for electric lamps. Committees for the purpose of standardising fittings and reflectors are now in being. Some notable street lighting installations have been executed, special mention being made of the introduction of posts, each bearing two 1,500-W lamps in appropriate fittings at Charing Cross.

After Mr. J. G. Clark had read a similar summary of developments in gas lighting, some views showing new methods of lighting introduced by Mr. A. Cunnington at Waterloo Station were shown. It was pointed out that the usual practice of concentrating all light downwards left the upper part of the station and roof in obscurity, and produced an unsightly effect. To remedy this, gasfilled lamps with opal bulbs had been mounted on the girders, with the result that the handsome facade of the building stood out clearly, and a pleasing general effect was produced.

Mr. W. G. Raffé gave a short address on the psychological aspects of illumination, drawing attention particularly to the possibilities of colour, and Miss Mary Wurm, who had acted as the controller of displays of light as an adjunct to music on the Continent, gave a short account of developments in theatre and operatic lighting in Dresden and elsewhere. Major Garrard demonstrated the Moonbeam "anti-dazzle" motor-car headlight, a feature of which is the manner in which light is cut off above a certain horizontal plane, so that ample illumination of the roadway, coupled with absence of glare in the eyes of pedestrians and approaching drivers, is secured.

Finally there was a display of several interesting novel lighting fittings by leading makers. Mr. T. E. Ritchie showing a new form of lantern with a ventilating appliance and special reflector, equipped with a 1,500-watt lamp, introduced by the G.E.C. This illuminated the entire hall, and was stated to give a maximum candle-power of about 7,000. Mr. L. E. Buckell showed a variety of colour-sprayed lamps, and Mr. Ives the new Benjamin biflector fittings, which are stated to be proving specially useful in the textile industry. Several new fittings introduced by the British Thomson-Houston Co., Ltd., were also on view, and an ingenious form of luminous sign capable of being run off a portable battery, and specially suitable for garages, was shown by Mr. E. T. Ruthven Murray.

The Provincial Electric Supply Association.—The annual meeting of the Provincial Electric Supply Association of the United Kingdom was held on November 25th. Mr. F. E. Gripper presided, in the absence of the chairman, Sir Harry Renwick, through illness. In the course of his speech Mr. Gripper said that although no particular benefits were expected from the London and Home Counties electricity scheme, there would be no additional burdens apart from contributions to the cost of its administration. The Association was acting in co-operation with other supply associations in the matter of the Rating Bill, a joint committee having been formed for the purpose. Objections on behalf of member companies had been lodged against the proposal to allow the Southern Railway to use energy supplied by the London Electric Supply Corporation for lighting as well as traction. The Association had declined to support the proposal to establish a "proving house" for electrical appliances as it would tend to add to the difficulties of supply undertakings and to increase the cost of appliances. Similarly it had declined to take part in the scheme for the registration of installation contractors. The Association had also differed from the Institution of Electrical Engineers in the matter

of the new Wiring Rules, which, it was considered, were unnecessarily strict. There had been a great deal of labour unrest, but the members had had uninterrupted peace. The demand for 10s. per week increase had been settled in favour of the employers. The report was adopted, and the executive committee was re-elected *en bloc*.

Institution Notes.

Institution of Electrical Engineers.—INFORMAL MEETINGS.—An extra informal meeting has been arranged to take place on Monday, December 15th, at 7 p.m., to discuss the new wiring regulations of the Institution. The discussion will be opened by Mr. F. C. Raphael.

At the informal meeting on November 24th Mr. J. W. Beauchamp was in the chair, when Mr. N. A. Allen opened a discussion on "The Use of the Electrostatic Wattmeter for the Measurement of Dielectric Losses in Cables." Mr. Allen had a large number of lantern slides showing a variety of methods of connecting the wattmeter to obtain different readings and check readings either for factory lengths of cable, or for quite small pieces of dielectric. The particular appeal of the subject attracted a number of members new to the informal meetings, and the few specialists who contributed to the discussion provided a debate of interest. Mr. G. L. Addenbrooke said that his own investigations had brought him to the conclusion that dielectric losses were due to minute particles of water which became ionised under electrical pressure. If they could get rid of the moisture they should get infinite resistance. Work on dielectrics was most promising for electrical discoveries. Prof. J. T. McGregor Morris asked if the use of the electrostatic wattmeter in compressed air had been considered. He felt it was a more suitable medium than one used in oil, as developed by Dr. Rayner. Mr. A. Rosen recalled the null method of testing, as described by Dr. Owen. He preferred, however, a bridge test as he had found it more flexible. Mr. A. J. Tracey reminded the meeting that commercial tests of cable lengths required immersion in water and introduced entirely new conditions. He felt that if it were possible to isolate losses in a 3-phase cable, it would be found that 75 per cent. were due to the fillers. Closer regard to the composition of the filler would result in considerable improvement. Messrs. J. W. Beauchamp, A. Collins, and R. M. Longman also spoke, and Mr. Allen replied.

Junior Institution of Engineers.—At an informal meeting on November 21st, Mr. J. G. Hopcraft spoke on the subject of "Stainless Steel." He dealt with the methods of working the metal by forging, casting and rolling, &c., and with the heat treatment. He said that it should be understood that the special properties of stainless steel were inherent properties and not merely superficial. The properties of withstanding heat and corrosion and remaining bright were produced immediately after tempering and removal of the scale, with polishing if necessary. A new stainless steel, combining a high degree of resistance to corrosion with extreme malleability, had recently been brought out, under the name of "Stabrite." This metal could be produced in sheets for cold-pressed articles which required no further heat treatment.

Society of Engineers. — On November 27th, a party of members paid a visit to the works which are being carried out in connection with the installation of escalators at the Tottenham Court Road Station (Hampstead tube). Mr. Hall, the resident engineer, conducted the visitors over the works, and explained numerous points for their benefit after tea at the Horseshoe Hotel.

On Monday last Mr. H. A. Rickwood, A.M.I.E.E., read a paper on "Recent Developments in Ferro-Concrete Cooling Towers," illustrated by lantern slides.

The annual general meeting is to be held on December 8th, when the report of the Council will be presented, and the result of the ballot for officers and Council will be announced.

Our Personal Column.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Mr. W. S. HIND has been selected by the Willesden District Council, from 150 applicants, for the post of commercial assistant in the Electricity Department.

The Edinburgh Corporation Electricity Committee recommends the Town Council to appoint a general manager for the electricity undertaking at a salary of £1,800 per annum. This recommendation involves the creation of a new appointment. The appointment of Mr. SEDDON as chief engineer, with an increase of salary of £200 per annum, is also recommended. Since Mr. Frank A. Newington retired Mr. Seddon has acted as engineer and manager.

The *Industrial Australian* states that Mr. A. DINNIE, who was chief engineer on the Mangahao (N.Z.) hydro-electric works contract, has been transferred to Arapuni, where he will represent the Government in the construction of the hydro-electric works by Sir W. G. Armstrong, Whitworth and Co.

A Shanghai paper states that Mr. N. G. BEALE, who has for some years been in charge of the engineering department of the General Electric Co. (of China), Ltd., was transferred on return from home leave, to Hong Kong as branch manager for the company in South China.

The Glasgow Corporation has authorised the tramway manager to present to Prof. HOWE, of the electrical engineering department of the University of Glasgow, for experimental research work, a 100,000-volt transformer, which has been out of use for some time, and the cost of which has been written off in the books of the department.

Mr. J. H. COWELL, the manager of Blackburn Corporation Tramways, has been elected a member of the National Executive of the Tramways Council.

Councillor ARCHIBALD BARRIE has been reappointed chairman of the Barrow Corporation Electricity Committee, and Councillor T. MORTON has been appointed vice-chairman for the ensuing year.

Mr. R. H. WOOD, of Sheffield, chief engineer of the Manchester Broadcasting Station, is about to take up a position at 2LO.

After 12 years' service at the Blackpool electricity works, Mr. SAM PRICE has taken an appointment with the Burmah Oil Co., Rangoon. He sailed from Liverpool on November 28th. Before leaving he was presented by Mr. C. Furness, the electricity works manager, on behalf of the staff and employés, with a leather travelling trunk and a fountain pen. Mr. Furness, after speaking in high terms of Mr. Price's services, pointed to the greater opportunities offered to young men in the Colonies.

Prof. W. CRAMP, head of the electrical engineering department at the University of Birmingham, distributed the prizes at the Hanley High School on Friday last.

Cable advice has been received of the marriage, at Bombay Cathedral, of Miss ADA HAWORTH, of Blackburn, and Mr. WILFRED OAKDEN, an electrical engineer in the service of Cawnpore Electrical Supply Co., who was formerly with the English Electric Co. in this country.

Mr. R. H. CAMPION, manager of the Chesterfield Corporation Tramways, who is leaving for London, was on November 27th presented by the superintendent and staff with two suit cases. Mr. D. H. DAVIES, the assistant manager of the electricity and tramway department, has been appointed manager of the electricity department at a salary of £650 per annum. Mr. C. E. CROSSLEY has been appointed deputy-manager of the tramway undertaking. A tramway manager is to be advertised for at £650 per annum.

Mr. D. ALLDRIDGE has been appointed electrical manager to Messrs. Lankester & Sons, Ltd., High Street, Southampton.

The *Electrical Engineer of Australia* states that Col. R. C. SIMPSON, lecturer in electrical engineering at the Sydney Technical College, is leaving for England on December 22nd, he having been granted six months' leave of absence after 20 years' service. The same journal reports that Mr. S. BUSCH, managing director, Swedish General Electric, Ltd., London, and Mr. G. PETRE, managing director, S.K.F. Ball Bearing Co., Melbourne, were entertained at dinner at Sydney on October 8th by members of the Swedish Chamber of Commerce.

Mr. H. C. VAN VALZAH, the newly-appointed Sydney manager of the Australian General Electric Co., Ltd., was originally a merchandising expert with the General Electric Co. at Schenectady.

The Main Committee of the British Engineering Standards Association has recently authorised the secretary, Mr. LE MAISTRE, to accept the cordial invitation of the German Standards Committee (the N.D.I.) to be present at its annual meeting on December 13th. He is also going to Prague to give an address on "Industrial Standardisation" before the recently-formed Czecho-Slovakian Standards Committee.

It is stated in the financial Press that Sir PHILIP DAWSON, M.P., has joined the board of Johnson & Phillips, Ltd., also that Sir JOHN WORMALD has resigned his seat on the board of Mather & Platt, Ltd.

Mr. C. H. FLOWER, lately with the Metropolitan-Vickers Electrical Co., Ltd., has been elected to a seat on the board of Messrs. Tredegars (1923), Ltd., electric lighting and power contractors, and has also been appointed managing director.

Mr. W. M. CARVER has resigned his position as managing director of Messrs. Drake & Gorham, Ltd., and has joined Mr. H. M. Leaf at 47, Victoria Street, London, S.W.1.

Obituary.—MR. W. HOUSTON.—The death took place on November 21st, at the Royal Infirmary, Glasgow, of Mr. William Houston, late electrician at Mollante, Castle-Douglas. He was 66 years of age.

M. L. LEVI.—The death is announced from Paris of M. Lazare Levi, one of the directors of the Compagnie Francaise pour l'Exploitation des Procédés Thomson-Houston.

Reference was made to the sudden death of Mr. J. H. CLOTHIER, electrical engineer, at the last meeting of the Lytham St. Annes Council. The Mayor (Ald. Critchley) said that Mr. Clothier was a capable and faithful servant. When he went to St. Annes the capital expenditure on the electrical undertaking was £19,000. It increased to £179,000 without any necessity of employing consulting engineers from outside. The Mayor paid a high tribute to Mr. Clothier's engineering ability.

MR. D. MOSELEY.—Mr. David Moseley, J.P., head of the firm of David Moseley & Sons, Ltd., Ardwick, Manchester, india-rubber manufacturers, died on November 27th, after an illness of only a few hours, at his residence, Buglawton Hall, Congleton, Cheshire, at the age of 62 years. For some time Mr. Moseley was chairman of the India-Rubber Manufacturers' Association. His widow was formerly Miss Agnes Preece, daughter of the late Sir W. H. Preece.

New Companies Registered.

Central Cables and Accessories, Ltd. (201,889).—Private company. Registered November 22nd. Capital, £3,000 in £1 shares. To carry on the business of manufacturers of and dealers in electrical goods of all kinds, general merchants, brokers, agents, factors, shippers, importers and exporters, &c. The first directors are:—A. A. W. Rowedit, 2, Bishopsthorpe Road, Sydenham, S.E., merchant (director, Grimston, Prichard & Plutte, Ltd.); P. Hallter, 6, Queenswood Road, Forest Hill, S.E., merchant (director, Grimston, Prichard & Plutte, Ltd.); J. Grevener, Highmere, Streathain Common, S.W.16, merchant (director, Grimston, Prichard & Flutte, Ltd.). Qualification, £1. Remuneration, £10 each per annum. Secretary: T. A. Blow, 1, Camp Villas, St. Albans. Solicitors: Syrett & Sons, 115, Moorgate, E.C.2. Registered office: Central House, Finsbury Square, E.C.2.

Vernilor Condensers, Ltd. (201,884).—Private company. Registered November 21st. Capital, £1,000 in £1 shares. To acquire the business of a wireless electrical engineer carried on by F. Addie, trading as "Francis Addie & Co.," at 23, Boundary Street East, Charlton-on-Medlock, Manchester, and to carry on the same and the business of manufacturers of and dealers in electrical receivers, regenerators, amplifiers, valve adjusters, condensers, valve pins and holders, &c. The directors are:—F. Addie, 87, Lloyd Street South, Rusholme, Manchester, wireless electrical engineer; E. P. Jackson, The Rowans, Alkrington Green, Middleton, Manchester, motor engineer; L. Jackson, The Rowans, Alkrington Green, Middleton, Manchester, dyer and proofer. Qualification, 1 share. Solicitor: J. H. Lea, 5, Norfolk Street, Manchester.

G. W. I. Valves, Ltd. (201,862).—Private company. Registered November 21st. Capital, £150 in 1s. shares. To carry on the business of manufacturers of thermionic valves of all types, repairers and reconditioners of wireless valves, &c. The subscribers (each with one share) are:—L. A. Bartlett, 10, Chilton Street, S.E.8, accountant; L. Bourer, 11, Ardgowan Road, Catford, S.E.6, clerk. The permanent directors are: A. N. White, L. C. Hutton, A. W. Hings, and F. F. Fuller. Qualification, 250 shares. Remuneration, £250 per annum, divided between them.

Southern Counties Electric Light and Power Supply, Ltd. (201,978).—Public company. Registered November 26th. Capital, £11,000 in 10,000 8½ per cent. participating (non-cumulative) preference shares of £1 and 20,000 ordinary shares of 1s. To carry on in the Southern and Western Counties of Great Britain the supply of electric light and power in all its branches. Minimum cash subscription, 100 shares. The first directors are:—Major J. Brigden, A.M.I.C.E., 69, Ferntower Road, Highbury, N.5; W. H. Mann, 5, Parkgate Road, Watford, merchant. Qualification, 25 shares. Remuneration (except managing director if any), £100 each per annum; chairman, £150. Solicitor: W. Thompson, 43, Cannon Street, E.C.4. Registered office: 170, Church Road, Hove.

Central Electric Development Co., Ltd. (201,984).—Private company. Registered November 27th. Capital, £1,500 in £1 shares. To adopt an agreement with T. S. Jones for the acquisition of certain patents and licences (British and foreign) for an invention relating to dynamo-electric machines, and to carry on the business of electrical contractors, manufacturers of and dealers in dynamo-electric and other machines, &c. The subscribers (each with one share) are:—C. D. Phillips, Cromer House, Newport, Mon., engineer; R. A. Phillips, Thorny Bank, Cheltenham, engineer; J. C. Phillips, Torbay House, Stow Park Avenue, Newport, Mon., director; T. N. Prosser, Hawthorns, 1, Stow Park Circus, Newport, Mon., engineer; L. Morgan, Underwood, Portskewett, accountant; A. Peaker, 7, Gibbs Road, Newport, Mon., mechanical engineer. The first directors are not named. Secretary: L. Morgan. Solicitors: Hornby and Baker Jones, Bank Chambers, Cambrian Road, Newport, Mon.

Revo Engineering Co., Ltd. (201,992).—Private company. Registered November 27th. Capital, £1,000 in £1 shares. To carry on the business of electrical and general engineers, &c. The first directors are:—E. W. Hovenden (permanent managing director), 4, Shaftesbury Avenue, Bedford, hydraulic engineer; H. Leese, 36, Elstow Road, Bedford, hydraulic engineer; L. R. Luchford, 74, Elstow Road, Bedford, electrical engineer. Qualification, 5 shares. Secretary: H. Leese. Solicitor: A. Farr, 10, St. Paul's Square, Bedford. Registered office: 44 and 46, Castle Hill, Bedford.

Wholesale Electric Lamp Co., Ltd. (201,999). — Private company. Registered November 27th. Capital, £1,000 in £1 shares. To carry on the business of dealers in all kinds of electrical goods and accessories, general hardwaremen, &c. The first directors are:—Mrs. M. Harrison (permanent managing director), 78, Woodstock Road, Bedford Park, W.4; Rose Harrison, 78, Woodstock Road, Bedford Park, W.4, sole manager. Qualification, £25 shares. Remuneration as fixed by the company.

Wireless Valves, Ltd. (201,950).—Private company. Registered November 25th. Capital, £2,000 in £1 shares. To acquire the business of repairing and dealing in wireless apparatus previously carried on by Wireless Valves, Ltd. (incorporated January 25th, 1924), and to adopt an agreement with the said old company and its liquidator and others. The subscribers (each with one share) are:—G. W. Vinsen, 9, King's Bench Walk, Temple, E.C., incorporated accountant; S. C. Butcher, 9, King's Bench Walk, Temple, E.C., articled clerk. The first directors are to be appointed by the subscribers. Solicitor: S. N. Carvalho, 6, Draper's Gardens, E.C.

West Wilts Electric Light and Power Co., Ltd. (201,952).—Public company. Registered November 25th. Capital, £25,000 in 2,000 6 per cent. cumulative preference shares of £5 each and 15,000 ordinary shares of £1 each. To carry on the business as indicated by the title. Minimum cash subscription, £7 shares. The first directors are:—G. Lansdown, Sholebroke, Trowbridge, Wilts.; A. A. Douglas, Lower Soughton, Northop, Flint, North Wales; J. H. Edwards (managing director), "Woodside," Cranham, Gloucester. Qualification, £500 shares. Secretary: H. Ledbury, 51, Fore Street, Trowbridge. Solicitor: C. E. Edwards, 16, St. Andrew's Crescent, Cardiff.

Alec Robertson Motors, Ltd.—Private company. Among the new companies registered in Scotland is the following:—Alec. Robertson Motors, Ltd., 365, St. Vincent Street, Glasgow, to carry on the business of engineers and electricians, and manufacturers of, agents for, and dealers in all kinds of engines, machinery, and electrical apparatus. Capital, £5,000 in ordinary £1 shares.

Swansea Engineers and Founders, Ltd. (202,023).—Private company. Registered November 28th. Capital, £3,000 in £1 shares. To acquire the business of electrical and mechanical engineers formerly carried on by the South Dock Engineering Co. at Harbour Road, Swansea. The permanent directors are:—H. H. Vye-Parminter, 10, St. James' Gardens, Swansea, engineer; E. J. Clode, 16, Eversley Road, Sketty, Swansea, superintendent engineer; J. H. B. Rees, 44, Malvern Terrace, Swansea, engineer. Qualification, 100 shares. Secretary: H. H. Vye-Parminter, 10, St. James' Gardens, Swansea. Solicitors: Trevor J. Rees & Co., Swansea.

Official Returns of Electrical Companies.

Macartney, McElroy & Co., Ltd.—Issue on November 5th, 1923, of £2,000 and on November 14th, 1924, of £3,000 debentures, parts of a series already registered. (Notice filed November 22nd, 1924.)

Multi-Way Earthing Clips, Ltd.—Particulars filed of £600 debentures authorised by resolutions of September 12th and 23rd, 1924, charged on the company's property, present and future, including uncalled capital, the whole amount being now issued.

Kingsmill Art Metal and Electrical Co., Ltd.—Debenture dated November 13th, 1924, to secure £515, charged on the company's undertaking, present and future, including uncalled capital. Holder: E. Allen, 16, Eastcheap, E.C.3.

John R. Kinsey & Co., Ltd.—P. J. Poole, of 70, George Street, Croydon, was appointed receiver and manager by order of the Court dated November 18th, 1924.

British L.M Ericsson Manufacturing Co., Ltd. (79,061).—Return dated April 10th, 1924. Capital, £200,000 in £1 shares (99,990 preference and 100,010 ordinary). All shares taken up. £170,000 paid, being £1 per share on 50,010 ordinary and 99,990 preference, and 8s. per share on 50,000 ordinary. £30,000 (12s. per share) is considered as paid on 50,000 shares. Mortgages and charges, £100,000.

Telegraph Condenser Co., Ltd. (110,048).—Return dated July 27th, 1923 (filed August 9th, 1924). Capital, £5,000 in £1 shares. 2,000 shares taken up. £2,000 considered as paid. Mortgages and charges, nil.

Crompton & Co., Ltd. (129,649).—Return dated July 24th, 1924. Capital, £500,000 in 340,000 ordinary and 160,000 preference shares of £1 each. 326,769 ordinary and 140,725 preference shares taken up. £1 per share called up on 250,007 preference and 6,965 preference and 7s. 6d. per share on 133,760 preference shares. £307,753 2s. 8d. paid (including £621 2s. 8d. paid on 2,240 shares forfeited). £160,302 considered as paid, being £1 per share on 76,762 ordinary and 12s. 6d. per share on 133,760 preference shares. Mortgages and charges, £114,200.

W. H. Allen, Sons & Co., Ltd. (66,440). — Return dated June 30th, 1924. Capital, £500,000 in £1 shares. 408,750 shares taken up. £58,757 paid. £349,993 considered as paid. Mortgages and charges, £49,000.

W. R. Thornton & Son, Ltd.—Debenture dated November 1st, 1924, to secure £2,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: W. R. Thornton, Ruskinville, Dalton-in-Furness; A. A. Haynes, Dane Avenue, Barrow-in-Furness.

Electrical Supplies (Liverpool), Ltd.—Particulars filed of £3,000 debentures authorised November 14th, 1924, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £1,000.

Arthur Firth, Ltd.—A. France, incorporated accountant, of Lancashire and Yorkshire Bank Chambers, Cleckheaton, ceased to act as receiver or manager on November 13th, 1924.

Electricity, Gas, Share, Debenture, Investment and Guarantee Trust, Ltd.—Particulars filed of £25,000, debentures and bonus of 3 per cent., authorised October 21st, 1924, charged on the company's property, present and future, including uncalled capital, the whole amount being now issued.

City Notes.

India Rubber, Gutta Percha & Telegraph Works Co., Ltd.

The annual meeting was held on November 27th, Mr. C. H. Gray presiding. In moving the adoption of the report (*vide* ELEC. REV., November 21st, p. 787), the Chairman said that the profit showed a slight improvement, sufficient to indicate that the advancement in 1923 from those dark days of 1921 and 1922 was being maintained, and that the corner was turned; the distinct signs of improvement in the whole of the company's activities were very encouraging. Whilst he could report very satisfactory progress at home, he was sorry to say that he could not report the same progress at their works in France. Nevertheless, the last quarter of their financial year had shown an improvement, and on the whole he thought the future was brighter. Referring to the balance sheet, after pointing out that the reserve fund had been increased by £40,000 to £220,000, the Chairman said that the cash position was very much better than it was last year. The cash on current and deposit accounts, cash in hand, and Treasury bills purchased, stood on August 31st at £134,119. That was £28,294 more than last year, which, coupled with the fact that they did not owe their bankers anything, was highly satisfactory. The £325,731, representing stock in trade, was practically the same as last year. Having referred in detail to the Persan business, he said that with regard to the Palmer tire department, the trading results there, though better than last year, were not satisfactory. The aeroplane tire and wheel section of that business had been satisfactory, and there was an increase in the sale of their cycle tire covers as compared with last year, although in the cycle tube section the result had shown a falling off. There had been an improvement in the cycle tire export trade. As to the motor tires, the result had been disappointing owing to the Flexicord tire, which was offered to the public, having had a technical fault in the manufacture which was not discovered in time. Since that fault had been eliminated the experimental tires they had run appeared to give results at least as satisfactory as any of the competing tires, and they hoped with that tire to regain the confidence of their customers. With reference to their submarine cable department, he had to report a considerable increase over last year in the amount of the sales. In reviewing and analysing the work done at Silvertown dur-

ing the past year, it was quite clear from the figures that the very complete costing system now established there produced a marked improvement in the result of the year's trading. The feature of the year's sales was the large difference between the two halves of the year in the turnover. Approximately 40 per cent. of the sales had taken place in the first six months and 60 per cent. in the second six months. That difference, to some extent, arose out of seasonal requirements, but apart from that there seemed to be a general improvement in the demand for their goods. An examination of the sales of the two years brought one to the conclusion that the increase in the volume of business was about 10 per cent. as against the increase in value of 7½ per cent. Out of twelve of their principal lines produced at Silvertown and Burton, ten showed a marked advance, and two a fall in value. The grand total of the past year's sales was 10 per cent. greater than the average for the five pre-war years 1909-1914. Slightly lower selling prices prevailed during the year as compared with the preceding year. The company's radio accessories seemed to be in increased demand. The value of orders received and the value of orders on the books, as well as the value of sales effected during the first four weeks of the current year, showed a marked improvement on the position of twelve months ago. These increases were general, and were shared by the majority of shops and departments so far as orders were concerned, and by the majority of branches so far as sales were concerned, and should that condition of things continue, they hoped during the current year to show a further general improvement. Although competition was still very keen, they hoped to meet it successfully without having to cut unduly their prices or profits. With reference to labour they had had no trouble of any kind with their workpeople during the past year, and there appeared to be no doubt that the improvement in the output per worker was being maintained. In the near future they had to prepare for the coming active competition with Germany. How soon that might arise depended on many factors, but come it would, and they had to remember that they would then be in competition with a country free from domestic debt, and with well-organised industries, assisted by a skilled, docile and thrifty people. They had to avoid strikes, sympathetic or otherwise, they had to forget ca'canny methods, and simply rely on hard work and intelligence, which he felt sure the Englishman was capable of producing when called on. In that connection it would assist the manufacturers of this country if the Government would take such steps as were necessary with regard to taxation.—Col. A. Weston Jarvis, C.M.G., seconded the motion.—Replying to questions, the Chairman said that if they could see their way to making money out of the sale of Persan they would get rid of that branch. They had found the production of radio apparatus quite a good business and apparently it would be an increasing one. With regard to the payment of an interim dividend he could not make any promise. If they could see clearly ahead they would act in that direction, but until the outlook was quite clear it would be unwise to resume those payments. —The report was adopted.

Western Telegraph Co., Ltd.

The annual meeting of the company was held on November 27th. Sir John Denison-Pender, G.B.E., K.C.M.G. (Chairman), who presided, said that they were able to present a satisfactory statement for the year, although the actual traffic carried had been less than in the preceding twelve months, the receipts from messages being £83,847 less than in 1922-23. Against this decrease the dividends from the subsidiary companies amounted to £52,248, so that after all the total receipts from all sources were only £32,377 less than in the last account, and the reduction of expenses made an improvement of £132,236. Expenses of improved apparatus for cable working show an apparent saving of £7,992, but these charges were debited against the reserve fund. The amount of this item was £27,838, but it was an expenditure which had added to the efficiency of the cable service. The expenses attending maintenance of cables were less by £27,672 and there was a decrease of £40,884 in income tax and corporation profits tax. A surplus of £150,000 was carried to the reserve fund, but this fund had been charged with £98,950, costs of diversion and renewals of cables, &c.: thus after payment of dividends the substantial sum of £327,322 was carried forward to the next account against £329,739 brought in. The first interim dividend for 1924-5 at the same rate, namely, 10 per cent., would be paid on December 20th. Further expenditure on capital account had been made during the year under review amounting to a total sum of £25,291. The principal item in this amount was £12,812 being the cost of 1,500 new ordinary shares of 50 Argentine dollars each, in a telegraph and telephone company in Argentina with which the company had a working traffic agreement. It was a successful concern. The remainder of this sum was expended in comparatively small amounts on new offices and additional staff quarters at various stations on the system. In July last all stations abroad and the cable steamers were asked to form committees from members of the staff to consider and suggest means by which further economies in working expenses could be effected, and within the last few days the results of meetings had been received, and he was much impressed with the support and loyalty to the company which were evidenced by the suggestions made not only by the British, but by the native staffs of all the countries which they served. In conjunction with the other associated companies, the whole matter was being considered, and it was hoped that the decisions arrived at would take effect at the commencement of next year. They had replaced two old cable steamers, and the new vessels, the "Norseman" and the "Cable Enterprise" were both at their stations on the east coast of South America. The entire cost of these two vessels had been debited to the maintenance ships' reserve fund. At the general meeting of the Eastern Telegraph Company in June last, reference was made to the negotiations then proceeding with the French Government for the lease of a special wire between Paris and London. The object of the special wire was to reduce the transmission delay upon telegraphic correspondence of northern France carried to the east and west by the associated companies. Up to the present their endeavours had not met with success, but their case was a strong one, seeing that the North American cable companies, as well as the French Cable Co., in competition with them for South American traffic, were allocated special wires to and in Great Britain for their traffics, and in common justice the Post Office should see that a British company was granted the same facilities as were accorded to these foreign cable companies.

The Argentine Transradio station at Monte Grande, near Buenos Aires had been opened. The wireless communication in Brazil, which had been established for a number of years, continued to function without material injury to the company.

At the last meeting he had referred to the concession granted to an Italian company to lay a cable to Azores, joining Italy with North and South America. Certain negotiations took place between those concerned, *viz.*, the Western Union Telegraph, the Italian company and themselves, which resulted in an agreement whereby the Western Telegraph Co.'s South American traffics were protected at Azores, not only at the outset but later on when the projected direct Italian-South American cables became interrupted. Within the last two months the second section of the concession, the Italian cable from Malaga to Azores, had been laid, and the first section between Rome and Malaga, to complete the connection with Azores, was in course of manufacture. When the Italian through line was completed it would serve Rio de Janeiro, Montevideo, and Buenos Aires, and would compete with the company at those points. The company could rely upon being as efficient, if not more so, owing to the experience which it had gained and the Italian company had to gain. If that was the case, although it would take traffic away from the company, he thought that the company would be able to hold its own at any rate.

Brisbane Electric Tramways Investment Co., Ltd.

The annual meeting was held on November 26th. Mr. H. R. Beeton (the chairman) presided, and said that the meeting had been delayed in order to enable the board to report the satisfactory settlement of all matters. The issue of 5½ per cent. stock of the Brisbane Tramways Trust had been made on less than a 5½ per cent. basis, and on more favourable terms to the company than was possible at an earlier date. It had resulted in the company being entitled to receive a sum of £4,549, representing half of the present value of the benefit accruing to the Brisbane Tramways Trust. The purchase money for the undertaking, together with all interest due under the agreement, had been paid. The Brisbane Tramways Trust issue of 5½ per cent. stock had been largely oversubscribed. A resolution for the voluntary winding up of the company would be submitted to the meeting, and the liquidator, if appointed, proposed with all possible dispatch to pay off the preference shares, and make a substantial payment on account of the ordinary shares. In reply to questions, the Chairman said that it was hoped that the liquidator would be able to make an early payment of £4 14s. per ordinary share, with a subsequent 8s. per share, though as to the latter figure he did not wish to commit himself in any way. The report and accounts were adopted, and the resolution placing the company in voluntary liquidation was approved.—*Financial News.*

Clyde Valley Electrical Power Co.

Sir F. C. Gardiner, in moving a resolution at an extraordinary general meeting on November 26th, authorising the issue of 600,000 ordinary shares, stated that the company was extending the plant at its central station in order to be ready for the increase in demand for power, which was coming upon them all the time, and would come in a greater degree when there was a recovery of trade. They were harnessing the Falls of Clyde, and in 18 months or two years they would have the power there connected with their system. The resolution was adopted. The shares are to be offered entirely to ordinary shareholders at the price of 22s., and any not taken up are to be sold in the market on behalf of the company.

Norwich Electric Tramways Co.

The report for the year ended June 30th last shows total receipts of £81,914 and an expenditure of £65,301, leaving a net profit of £16,613, as compared with £20,360 in 1922-23. To this is added £2,555 brought forward, making £19,168. £10,000 is transferred to reserve, a dividend of 3 per cent. absorbs £7,920, and the balance (£1,248) is carried forward. The number of passengers carried rose from 11,687,362 to 12,386,659, and the car-miles run from 1,002,663 to 1,017,575. An extensive programme of renewals was carried out during the year.

Agricultural and General Engineers, Ltd.

The report for the year ended March 31st last states that the scheme for the reorganisation of the capital was approved by the Court on November 18th. The accounts show a net balance of £6,884, as compared with a loss of £10,430 in 1922-23. The business of the Associated Companies has been adversely affected by the depression at home and abroad, but the exercise of economies and a slight increase of turnover effected a considerable improvement upon the previous year's results. The combined trading of these companies showed a manufacturing profit of £362,805 and a net profit of £18,902, as against a net loss of £130,275. The arrears of dividend on the preference shares will be satisfied by the issue of ordinary shares. Meeting: December 16th.

French Electrical Companies.

The *Société Electro-Cable* reports net profits amounting to 4,191,000 fr. for 1923-24 as compared with 3,098,000 fr. in the previous year. Dividend at the rate of 40 fr. per ordinary share as against 35 fr. in 1922-23.

The *Société Industrielle des Téléphones*, whose financial results were recently recorded, reports that the turnover materially increased during the year. Orders were obtained for the construction of automatic multiple switchboards at Vichy and two other towns and for a manual multiple switchboard at Perpignan, as well as for extensions in other places. The workshops installed in the buildings acquired from the Société de Paris-Anzin had been set in operation and were equipped for the construction of telephone cable and for long-distance cables. The company carrying out long-distance connections, in which the company is interested, had contracted for the construction of various cables, including Lyons-Saint-Etienne, Paris-Havre and Paris-Juvisy.

German Electrical Companies.

The *Bergmann Electricity Company*, of Berlin, has decided to reduce the paper share capital to 33,000,000 gold marks, this comparing with 52,000,000 marks ten years ago.

The *Rhenish Electricity Company*, of Mannheim, has transformed its accounts to a gold mark basis, showing substantially the same situation as in 1913-14. It is stated that from a remunerative point of view the undertaking is better placed than most industrial companies as it owns power stations and participations in other stations which are carried on in conjunction with different local authorities.

The *Rheydt Kabelwerk Gesellschaft*, of Rheydt, is reorganising its capital from a paper to a gold mark basis by reducing the issued ordinary shares from 100 million paper to 5 million gold marks and the preference capital from 2 million to 60,000.

The *Bayerische Elektricitats-werke Gesellschaft*, of Munich, is also reducing its ordinary share capital from 80 million marks paper to 4 million gold and the preference share issue proportionately.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Siemens Brothers & Co.—15,000 new 10 per cent., cumulative preference shares of £1 each, fully paid, Nos. 300,001 to 315,000.

Traction and Power Securities Co.—£200,765 4½ per cent. debenture stock.

Clyde Valley Electrical Power Co.—600,000 new ordinary shares of £1 each, issued at £1 2s. per share, of which 7s. is payable on acceptance and allotment, Nos. 600,001 to 1,200,000.

Isle of Thanet Electric Supply Co.—150,000 ordinary shares of £1 each, fully paid, Nos. 1 to 150,000; 210,000 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1 to 210,000; and £150,000 4 per cent. debenture stock.

Salisbury Electric Light and Supply Co.—50,000 ordinary shares of £1 each, fully paid, Nos. 1 to 50,000; 12,500 new ordinary shares of £1 each, 10s. paid and fully paid, in advance of calls, Nos. 50,001 to 62,500.

Yorkshire Electric Power Co.—5,000 ordinary shares of £1 each, fully paid, Nos. 1,085,001 to 1,090,000.

Johnson & Phillips.—62,500 new shares of £1 each issued at £1 2s. per share, fully paid, Nos. 437,501 to 500,000.

Application has been made to the Committee to allow the following to be quoted officially:—

Enfield Cable Works.—202,056 ordinary shares of £1 each fully paid, Nos. 1 to 202,056.

Yorkshire Electric Power Co.—5,000 ordinary shares of £1 each, fully paid, Nos. 1,085,001 to 1,090,000.

The undermentioned have been ordered to be officially quoted:—

West Gloucestershire Power Co.—£300,000 six and a-half per cent. participating preference stock and £300,000 five and a-half per cent. first mortgage sinking fund debenture stock.

Isle of Thanet Electric Supply Co.—150,000 6 per cent. cumulative preference shares of £1 each fully paid, Nos. 1 to 150,000, and £150,000 4 per cent. debenture stock.

Venezuela Telephone and Electrical Appliances Co., Ltd.—The available balance, after deducting debenture and loan interest, taxation, &c., was £20,734. Out of this a dividend of 8 per cent. for the year is to be paid on the ordinary shares, £1,500 is transferred to the first debenture sinking fund, £10,000 is placed to reserve for renewals and depreciation, and a balance of £555 is carried to undivided profits account. Meeting: December 11th.

Pennsylvania Water and Power Co.—A dividend of $2 per share has been declared on the common shares in respect of the quarter ending December 31st.

Prospectus.—*Anglo-Spanish Construction Co., Ltd.*—The prospectus of this company was published in the Press on Monday, not for the purpose of inviting subscriptions, but to meet Stock Exchange regulations. The company will carry on the business of contractors, and in particular will construct and equip 260 miles of railway from Ontaneda to Calatayud, *via* Burgos and Soria. Messrs. Couper & Wickham have been appointed the company's consulting engineers in London. Sir Lionel Phillips is chairman of the company and Mr. A. W. Tait is one of the directors.

Anglo-Argentine Tramways Co., Ltd.—The municipality of Buenos Aires has now definitely refused to sanction an increase in the company's tariffs, and, in addition, has terminated the company's concession to build a subway in the city. The company has been advised that the latter decision is illegal, and is taking steps to protect the shareholders' rights.

Tube Investments, Ltd.—Out of the profits for 1923-24 the directors are paying a dividend of 7½ per cent. (as against 7 per cent. for 1922-23), and carrying forward £48,336. The company has subscribed for 150,000 preference shares of £1 each at par in Bromford, Ltd., in substitution of loans to this amount, and has also paid the final call of £10,000 on the shares taken up in J. A. Phillips & Co.

Manaos Tramways and Light Co., Ltd.—The gross receipts for 1923-24 fell from £130,439 to £126,751, but, due to decreased expenses, the net profit rose from £42,692 to £44,023. After adding interest, &c., and deducting debenture redemption and other charges, there remains £9,962. £8,000 is transferred to the renewal reserve and the balance to the debenture interest account. Meeting: December 8th.

East London Railway Co.—A provisional agreement has been entered into with the Southern Railway Co. to transfer the company's assets. The debenture stockholders will receive securities of the Southern Railway in exchange for their holding, while the holders of consolidated stock will receive a cash payment. A meeting of stockholders is being held to consider the proposal and, if thought fit, approving it.

Italian Power Co.—This company, which was formed in the United States last year with a directorate consisting of representatives of important American industrial and banking interests, has changed its title to "International Power Securities Corporation." The scope of the organisation is being widened to include other European countries and electrical companies in the United States.

Burmah Electric Tramways & Lighting Co., Ltd.—Out of the profits of the past year it is proposed to pay a final dividend of 2½ per cent. on the ordinary shares (making 5 per cent. for the year, as against *nil* in the previous year), and to place £10,000 to general reserve and depreciation fund, leaving £4,672 to be carried forward.

Dorman, Long & Co., Ltd.—The profit for the year 1923-24 increased from £275,454 to £504,984. No dividend is paid on the ordinary shares but £100,000 is written off for depreciation, and the balance carried forward is increased to £210,152.

Johnson & Phillips, Ltd.—Messrs. Johnson & Phillips are offering 62,500 shares of £1 each to holders in the proportion of one new share for every seven held, at 22s. per share. It has become necessary to increase the working capital owing to the continued expansion of the business, and the need for financing large and profitable contracts which are in hand.

Globe Telegraph & Trust Co., Ltd.—Quarterly dividends of 5s. net on the ordinary shares and 3s. on the preference shares, less tax, have been declared.

Brazilian Traction, Light and Power Co.—Quarterly dividend of 1¼ per cent. on the cumulative preference shares.

Stocks and Shares.

MONDAY EVENING.

WITH the advent of December, a marked falling-off of business is noticeable in many of the Stock Exchange markets. Investment and speculation are both a little less willing than they were to embark upon fresh engagements in the last month of the year. Notwithstanding that there is no expressed fear as to the likelihood of a rise in the Bank Rate, the incessant outpouring of new stock is having its effect, at last, in drying up the wells of supply whence capital is drawn. It is known, moreover, that there are a number of further demands to be made in the near future. Consequently, prices amongst investment stocks are inclined to be a little wavering, though for first-rate debenture and preference issues, buyers outnumber the sellers.

County of London ordinary shares have risen to 50s. 9d., at which price they stand 3s. 3d. above City of London ordinary, with which, a few weeks ago, they were running neck-and-neck. County ordinary are favoured by reason of the impression that the company has enormous scope for expansion through the medium of its Barking station; and, more immediately, there is the idea that it will not be long before some fresh issue of capital is made on terms that conceivably may provide a bonus for proprietors. The principal rise in the London list is one of 3/16 in London Electric 6 per cent. preference, which have gone up to 5 7/16, and have been changing hands as high as 5½. Newcastle-on-Tyne 5 per cent. preference are better at 17s. 6d., and the ordinary shares at 22s. are 9d. firmer. St. James' and Pall Mall at 12⅜ show ¼ rise. There is a fair amount of business being done in this department, although, as previously explained, it would be greater in extent were there to be more shares available for dealing in.

Anglo-Argentine Tramways first preference have fallen 6s. 3d., and the seconds 5s., on account of the active hostility shown to the company by the Municipal Council of Buenos Aires. Reference was made here last week to the unfortunate position that has arisen between the two bodies, and which has alarmed shareholders in the company. Both classes of shares have become difficult to negotiate, the basis being about £3 in each case. Brazilian Tractions fell back to 57½. Mexican Light and Power first bonds shed a point to 66. The Foreign Office is being urged to take definite steps in the matter of Mexican recognition by this country, for it is claimed, and probably rightly, that British trade is suffering by reason of the indeterminate position that still exists, diplomatically speaking, between the two countries.

The British traction group is tolerably steady, B.E.T. ordinary at 99½ being 2 up. London and Suburban Traction preference weakened, however, to 7s. 6d. London United Tramways debenture holds its rise at 56½. Metropolitans gained a point, and Underground Electric ordinary rose ½, the latter in consequence of the re-opening of the City & South London Tube on Monday in this week. Metropolitan-Districts are easier, but there is so scant an interest displayed in Home Railway stocks by the public at the present time that it takes little stock to move prices fairly sharply, in either direction, according to the mood of the moment.

The effect of the favourable Western Telegraph report is seen in a further rise of 5s. in Western Telegraph shares. Eastern Extensions, however, went back 5s. to the same price. The announcement that the Eastern companies are prepared to deal with Christmas greetings throughout the Empire, at reduced rates of expense, will no doubt be welcomed more warmly by people whose relatives can be reached by the companies' cables than by the staffs who had been looking forward to a calm and uneventful Christmas. Anglo-American preferred has strengthened to 105. A better tendency in Marconi ordinary lifted the price to 32s. 6d., and Canadians, after being down to 5s. 7½d., recovered to 6s. A meeting at which reorganisation of the capital is to be proposed will be held this month in Montreal. Callender's and Henley's have again yielded ground, to 2 13/16, and Siemens went back to 23s. 9d. On the other hand, British Aluminium are a good market at 28s. 9d.

The Clyde Valley Power Company is making a new issue to its shareholders, the new shares being offered at 22s., as against the present price of the old shares, 30s. cum dividend. The bonus is a substantial one to proprietors who should take care to see that they obtain the value of their rights by a sale in the market, or by taking up their new shares. In these investment companies, it happens, as we have said before, that shareholders, particularly those in the country, too often throw away their circulars as being of no particular value, without troubling to read them. This little warning may possibly be of some use to those who might otherwise fail to observe the substantial benefit to which they are entitled by the new issue of Clyde Valley shares.

Automatic Telephone new ordinary shares 4s. paid stand at 10s. 6d. premium, and International Telephone new, also 4s. paid, are quoted at 7s. middle. Telephone Manufacturing shares have come somewhat into demand at 7s. These are a speculation pure and simple. The company's 8 per cent. bonds at 96 are a reasonable speculative investment, but what value the shares may be must depend upon events whose course it is yet impossible to forecast with certainty. Edisons are better at 6s. 9d.; the first preference have risen to 18s. 9d., and the company's 5 per cent. debenture stock is 3 up at 76½. Venezuelan Telephones strengthened to 18s. 6d. upon the declaration of an 8 per cent. dividend.

Amongst the dollar stocks, Montreal Light & Power at 191 is 5 points down. Most of the shares and bonds quoted in dollars are easier on the week, owing to the incidence of the New York exchange. The rubber market shows firmness, rubber itself touching 1s. 6d. per lb. on Saturday, though reacting a shade from the top. Shares in the good rubber companies are too well held for there to be much market activity; the difficulty is to secure any free supply of stock when buyers come forward who want it.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1923.	Dividend. 1923.	Price Dec. 1, 1924.	Rise or fall.	Yield, p.c.
Brompton Ordinary	1	12	10	1⅝	—	*£5 6 8
Charing Cross Ordinary	1	14	14½	2½	—	6 0 0
do. do. do. 4½ Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	10	12	87/6	—	6 8 0
City of London	1	15	15	47/6	—	6 6 4
do. do. 6 % Pref. ...	1	6	6	23/6	—	5 2 2
County of London	1	10	15	50/9	+9d.	5 18 1
do. do. 6 % Pref. ...	1	6	6	23/6	—	5 2 2
Edmundson's Ordinary	1	7	7	22/-	—	... ...
do. 6 % Pref.	1	6	6	23/6	—	5 6 6
Kensington Ordinary	5	13	14	9½	—	7 5 5
London Electric	1	10	10	32/6	—	6 3 1
do. do. 6 % Pref. ...	5	6	6	5⅛	+ 1/16	5 10 4
Metropolitan	1	8½	10	1⅞	—	5 6 8
do. 4½ % Pref.	1	4½	4½	17/6	—	5 2 10
Newcastle-on-Tyne Ordinary ...	1	2½	5	22/-	+9d.	5 9 1
do. 5 % Pref. ...	1	5	5	17/6	+6d.	5 14 3
do. 7 % Pref. ...	1	7	7	25/-	—	5 12 0
Notting Hill 6 % Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6 % Pref. ...	1	6	6	1⅛xd	—	5 6 6
Urban Ordinary	1	—	4	19/8	—	4 4 8
do 8 % Pref. ...	1	5	8	19/6	—	8 3 1
St. James' and Pall Mall ...	5	14½	17½	12⅜	+ ¼	6 17 3
South London	1	11	15	9½	—	6 13 4
South Metropolitan Pref. ...		7	7	1½	—	5 12 0
Westminster Ordinary	5	12	15	11	—	6 16 4
Whitehall Elec. Invst. 7½ % Pref.	1	7½	7½	19/-	—	7 18 9

HOME RAILS.

Central London Ord. Assented	Stock	4	4	70½	—	5 14 2
Metropolitan	,,	3½	4	78½	+1	5 0 8
do. District	,,	3	3½	53½	— ¼	6 10 10
Underground Electric Ordinary	10	Nil	Nil	2⅜	— ¼	Nil
do. do. "A" ...	1	Nil	Nil	8/8	—	Nil
do. do. Income	Bonds	5	5	99	—	*3 1 3

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	105	+ ½	5 14 3
do. Def.	,,	1½	1½	24½	—	6 3 9
Chili Telephone	5	6	6	5⅝	—	*5 2 2
Cuba Sub. Ord.	10	7	7	7	—	10 0 0
Eastern Extension...	10	10	10	17	— ¼	*5 17 8
Eastern Tel. Ord.	Stock	10	10	170½	—	*5 17 4
Globe Tel. and T. Ord.	10	10	10	17½	—	*5 14 3
do. do. Pref.	10	6	6	11½	—	5 6 8
Great Northern Tel.	10	24	25	30½	—	7 5 8
Indo-European	25	7	7	23½	—	*5 6 1
Marconi	1	15	10	32/6	+ 1/16	6 3 0
Oriental Telephone Ord.... ...	1	12	12	1⅝	—	*6 8 9
United R. Plate Tel.	5	8	8	6⅝	—	*5 16 5
West India & Panama	10	Nil	Nil	1/-	—	Nil
Western Telegraph	10	10	10	17	+ ½	5 17 8

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	12½	5½	5	— ⅛	9 3 4
do. do. 2nd Pref. ...	5	5½	6	2⅝	— ½	10 4 4
do. do. 5% Deb. ...	Stock	5	5	73¼xd	—	6 16 0
British Electric Traction Ord. ...	,,	5	5	99½	+2	5 0 6
do. do 6% Pref. ...	,,	6	6	105½	—	5 13 10
Brazil Traction	100	4	4	57½	—1½	6 19 2
Brit. Columbia Elec. Rly. Pcs.	Stock	5	5	88½	—	5 13 0
do. do. Preferred	,,	5	95/-	88½	—	*5 8 6
do. do. Deferred	,,	2	120/5	111½	—	*5 16 0
do. do. Deb.	,,	4½	4½	81½	—	5 4 -
Lond. & Sub. Trac. 5 % Pref. ...	1	5	2½	7/6	—6d.	6 13 4
London United Tram. Deb. ...	Stock	4	4	56½	—	7 1 7
Mexico Trams. 5% Bonds ...	—	Nil	5	75	—	6 13 4
do 6% Bonds ...	—	Nil	Nil	56	—	Nil
Mexican Light Common ...	100	Nil	Nil	24	—	Nil
do. Pref.	100	Nil	Nil	60½	—	Nil
do. 1st Bonds ...	—	5	5	66	—1	7 11 6

MANUFACTURING COMPANIES.

Babcock & Wilcox...	1	20	12	49/3	—	*4 17 6
British Aluminium Ord.... ...	1	5	5	28/9	+9d.	5 1 8
British Insulated Ord. ...	1	15	15	66/3	—	5 9
Callenders	1	15	15	2⅞	— 1/16	5 6 9
do. 6½ Pref....	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	5	Nil	⅛	—	6 17 10
Edison-Swan	4/-	7½	—	6/9	+6d.	4 8 9
,, 5% Deb.	Stock	5	5	76½	+3	6 10 9
Electric Construction	1	10	10	30/-xd	—	6 13 4
English Electric	1	8	8	19/3	—	5 4 0
do. do. Pref.	1	6	6	1	—	6 0 0
Gen. Elec. Pref.	1	6½	6½	23/3	—	5 11 10
do. Ord.	1	5	5	21/-	—	4 15 3
Henley	1	15	15	2⅛	— 1/16	5 6 9
do. 4½ Pref.	5	4½	4½	4¼	—	5 6 0
India-Rubber	1	10	8	18/9	—	*5 6 8
Met.-Vickers Pref....	2	8	8	9½	+ 1/16	6 8 0
Siemens Ord.	1	5	—	23/9	—9d.	4 4 3
Telegraph Construction	12	20	20	26	—	*4.12 2

*Dividends paid free of Income Tax.

Increased Production—Decreased Unemployment.

(*Continued from page* 832.)

HAVING referred to overhead expenses, we will now deal with a few points of principle in the proper recording of overhead expenses. We have already referred to the wisdom of separating factory expenses and commercial expenses, enabling the cost of running the factory to be watched without its being mixed up with selling expenses. The managements of many firms have the habit of considering their factory expenses purely as a percentage of labour, and if these come out at the rate of, say, 100 per cent. of labour, they think the shop is being run efficiently. This conclusion is not necessarily correct, as a similar shop working on an overhead of 150 to 200 per cent. may be manufacturing a great deal cheaper than the factory working on 100 per cent. Thus factory expenses by themselves must not be considered as a percentage to labour only, as an indication of the cost of the final product, but rather as a factor in the total cost of an article. To emphasise what is meant by this, we would give as an example the case of two absolutely similar articles made by two different factories, by collaboration between two firms; after completion, the costs were compared, and it was found that in one factory, taking its labour cost as 100, the percentage of factory expenses allocated was 200, the total cost being 300. In the other factory, the labour, taken on the same basis, was 240, and factory expenses 215, that is, only 90 per cent. of direct labour, but the total cost of the same article was 455. In spite of the fact that the ratio of factory expenses to direct labour was very much lower in the latter case, the total cost of the article was over 50 per cent. greater. The difference between the two factories was that in the one where the cost was 300 the machinery was more modern and there was a proper planning department which ensured that the most economical class of labour was used on the most economical machine.

Thus when considering reducing costs, undue attention should not be given to cutting down overhead expenses; all factors other than percentage to direct labour must be given consideration, for although the total overhead charges of the factory may show an economy, this economy may be entirely annulled owing to the increased cost of manufacture due to a curtailment of the supervisory staff. If one is satisfied that the policy, so far as manufacturing is concerned, is a right one, it should be adhered to with courage and conviction, and the policy of the other sections, selling and costing, should be formulated accordingly, for if the policy is right, successful results must finally accrue.

Many firms, of course, work on a direct percentage-to-labour basis, and in the case of a factory manufacturing one standardised article, no arguments can be made against this. For instance, in the Ford factory there is practically no costing system at all except by department, *i.e.*, a definite amount of material with a definite number of employés must give a definite number of parts per week, month, or year, as the case may be, and the cost is on this basis. In a factory making all kinds of apparatus, the percentage-to-labour basis of absorbing overheads is most unwise, as the following example will prove:—Take the case of two identical turret lathes doing the same operation in a factory where overhead expenses were fixed at 100 per cent. to labour; assume that in one case the machine is operated by a boy whose wage is 7½d. an hour, and in the other by a man whose wage is 1s. 3d. an hour. If two similar articles were produced on these lathes, each taking an hour, the cost of one would be charged with factory expenses at 7½d. for the hour's operation, whereas the other would be charged 1s. 3d. Obviously one or both of these charges must be wrong. We think it will be agreed that the actual cost of running these similar machines will be approximately the same, as the two lathes occupy the same floor space, require the same amount of power to drive them, and involve similar supervision from the foremen (probably more in the case of the boy), need the same overhead expenses for costing, planning, management, depreciation, &c., and, therefore, should not be contributing to factory expenses at different rates. Again, in one case the man takes an hour, whereas the boy takes two hours, the cost of labour thereby being equal in both cases, but as in the case of the boy only half of the possible output is being obtained from the lathe, the maximum possible output is not being reached by the factory; the cost figures, if based on the fixed percentage-to-labour basis, will not disclose this. Incidentally, this emphasises another question of management, namely, that it is not always necessarily sound economics to use the lowest class of labour. The thing that matters is the ultimate cost of a job, and this, of course, must be a function of the relative output of the machine tool.

Having pointed out the anomalies of absorbing factory expense as a percentage to labour, we suggest that this position can be avoided if the overhead expenses are absorbed by charging a definite figure per hour for each machine or group of machines. In other words, the factory expense, to be accurate, should be based on a machine hourly rate irrespective of what class of labour is used, by estimating the cost of running this machine for a unit of time and distributing this cost over the machine's normal working hours of whatever unit of time is chosen; thus, if the unit taken is a 47-hour week, the normal week is arrived at after allowances have been made for any standing time that is likely to occur in connection with the machine. For an ordinary turret lathe this may be taken as perhaps 44 hours per 47-hour week. Of course, for larger tools which may be working for a much shorter time during the week, allowance would have to be made accordingly.

We would also point out that where the employment of lower-grade labour means extra factory expenses in the form of supervision, repairs to machinery, &c., this can properly be debited against the machines being so operated in the hourly rate for the machine.

Selling Expenses.

The same arguments can be applied equally well to selling expenses. Although many manufacturers go to great detail in the allocation of their factory expenses, they do not always do so in the case of commercial expenses, largely because of the difficulties of making allocation. Nevertheless, if the matter is properly studied, much improvement can be made in the method in common use of distributing selling expenses as a percentage over the whole production of a large modern factory. There is not the slightest doubt that the actual cost of selling such articles as lamps, small motors, &c., is a greater percentage of costs in a factory than that of larger products. It should be arranged that the expenses that have to be absorbed should be recorded in such a way that the actual cost of them can be studied with reference to each particular class of manufacture. On this particular subject it is impossible to do any more than make this general statement as a guide, for opinions may differ as to the best way to absorb certain necessary expenses in the running of a business, but the principle should be adopted of taking into selling accounts all costs not directly connected with manufacturing.

(To be concluded.)

A Visit to the B.T.H. Co.'s Coventry Works.

The Manufacture of Radio Headphones.

SOMETHING well done on somewhat original lines is the impression gained from a tour of the Coventry factory of the British Thomson-Houston Co., Ltd., which has a floor space of approximately 4¼ acres. These works, which are devoted chiefly to the production of radio-telephone apparatus and magnetos, form an important section of the company's organisation, which consists also of works situated at Rugby, Birmingham, Chesterfield, and Willesden, covering a total area of over 190 acres and providing work for nearly 11,000 employés in the production of electrical equipment for all purposes.

Fig. 1.—Complete B.T.-H. Radio Headphones.

The B.T.-H. headphone is expressly made for broadcast reception, being a departure from the earlier article which was designed for less exacting requirements, and a successful combination appears to have been made of careful testing and inspection with large scale production methods. Designs and processes have not had to be adapted to suit existing machinery and the experience gained at Coventry in the manufacture of magnetos during the war period has been invaluable in the production of moulded earpieces and permanent magnetic characteristics.

It will be appreciated from fig. 1 that the headphones cannot catch in the hair because they have no projections and there is no "scissors" movement in the headband; they only weigh 9½ oz. (with cord), fit nicely to exclude extraneous sounds, but not tightly enough to be uncomfortable, and can be adjusted by a single movement without the manipulation of screws. Each pair is supplied with 5 ft. of cord, pin-tip ends, and a nickel-plated connector for connecting two or more sets in series.

Considerable care has been taken in planning operations and in regulating the flow of work through the factory, while manufacture has been reduced to a number of pressings and stampings, and assembly within a moulded earpiece. There is not a single screw, stud, or nut in the construction; therefore, nothing that can work loose in service. The sound box forms a single unit, and is made of a non-resonating compound into which the magnet and pole-piece assembly is embedded as shown in fig. 2, by a moulding process under hydraulic pressure in a steam-heated press. The sound box is made of moulded composition manufactured on the premises. It is coloured a dark tan, matches the leather headband, takes a high polish, and will withstand the rigours of service. The ear-cap is made of the same material and screws on to the box. A Stalloy iron diaphragm is clamped at its periphery between the earcap and sound box. This method of clamping without the use of a metal ring is an important feature of the construction, and has much to do with the quality of reproduction.

Wire headbands and stirrups are bent to shape in presses with the aid of jigs and the method of mounting the stem in an oval bearing ensures that the stirrup and earpiece cannot be completely rotated, and consequently kinks and twists in the flexible leads do not occur. Press-work is again used in the manufacture of the cobalt steel magnets. The pole-pieces are made from one stamping, which is cut to form two pole-pieces, and assembled by means of a press tool to the permanent magnet; grinding brings the pole faces to the right height. The spool is very thin, allowing the coil to be close to the pole-pieces. Very fine enamelled copper wire is used and for the outer layer a stouter wire is employed to provide a stronger lead for the connections. As there are no outside terminals on the earpieces (in fact, no screw terminals at all) the flexible cords are permanently attached to the inside connections. The whole design is very neat and simple. The leather covered headband and cord weigh only 9½ oz. These headphones have superlative tonal qualities and are most comfortable to wear, whilst the general appearance is pleasing and indicative of quality.

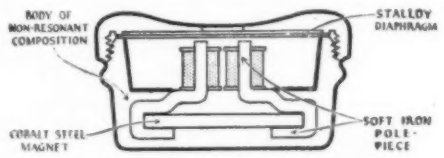


Fig. 2.—Earpiece Cross Section.

Production engineers will find interest in the assembly department on the top floor of the factory. Specially designed benches provide a correct working height for the operators, mostly women and girls, who sit at work on backed chairs. Supervision is evident, but not obvious, and the bright scheme of decoration produces a cheerful atmosphere. In addition to very good general lighting, where very fine operations are necessary, additional bench spot lighting is provided. The benches are so arranged that the workers are divided into five teams, each producing completed headphones. The operations carried out in each of the five sections comprise spool insulating, cord winding, attachment of leads, coupling coils and connecting to tags, fitting coils to magnets, connection of flexible cords, fitting of diaphragm, fitting stirrups, testing and boxing. The problem of quickly transporting the finished article to the dispatch department has been solved by utilising a belt conveyor, and means are provided for automatically indicating and registering the output of each team. Reasons for diminished output can therefore be promptly investigated, and a competitive spirit is introduced between the various sections.

In addition to continuity and resistance tests, each pair of 'phones is also tested for reception, particular attention being paid to the matching of the two earpieces by means of an

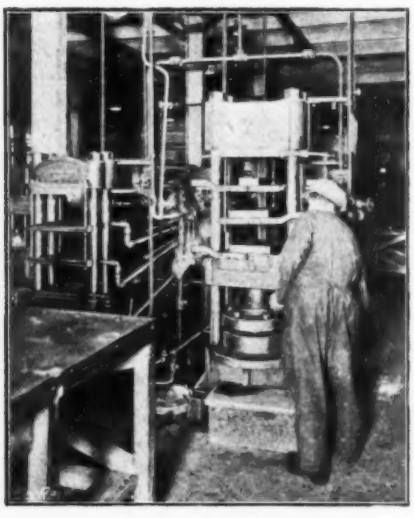


Fig. 3.—Some of the Moulding Presses.

Fig. 4.—Part of the Assembly Department.

electromagnetic transmission device, music from a gramophone providing a substitute for broadcasting. The employment of St. Dunstan's men for this work has proved very satisfactory, for having lost their sight they have been naturally compensated by the gift of a very acute sense of hearing. A final test and inspection takes place in the packing section of the stores department. Throughout the factory the various inspectors work under the direction of a chief who is under the immediate control of the works manager. The individual inspectors are in no way responsible to the foremen. Inspection and, if necessary, rejection of parts or completed headphones can thus take place without constraint. Research and development are continually going on in a special department, and although a most successful design has been obtained, there is evidently no intention of regarding it as being in any sense final.

The visit imparted the impression of a problem successfully solved on bold lines and sound reason.

London's Electricity Supply, 1922-23.

IN our last issue the L.C.C. report upon electricity supply in the London and Home Counties Electricity District during 1922-23 was reviewed in a general manner. The importance of the report and the interest attaching to it merit a further detailed consideration.

The general review showed that the number of consumers had grown at a faster rate, proportionately, than the sale of energy, indicating that the use by each consumer was lower. An examination of the figures of population and output, the former being based upon the 1921 census, discloses that the consumption of energy per head was 37.11 kWh in 1921-22, and 43.53 kWh in 1922-23, an increase of about 18 per cent., which, however, takes no account of the natural increase of population. The report recognises four classes of undertaking:—Metropolitan borough councils, extra-London local authorities, London companies, and extra-London companies. In 1922-23 the population of the Administrative County of London was 4,484,523, and the energy sold by the metropolitan borough councils and the London companies amounted to 527,624,136 kWh; this gives a consumption of over 117 kWh per head. On the other hand, the *per capita* consumption in the outlying districts, with a population of 3,780,210 and a total output of 230,615,331 kWh, was only about 61 kWh. This is the inevitable result of centralisation in a comparatively small area. Decentralisation would tend to bring the figures nearer one another, but this can only come about by the provision of cheaper supplies of electricity in the outlying districts; this is one of the largest problems that face the supply industry.

From the foregoing statements it would appear that the inner London undertakings should have the best load factors, but this is not the case. While the metropolitan borough councils and the London companies had "overall" load factors of 21.7 and 20.2 per cent., respectively, the extra-London local authorities' and companies' load factors stood at 24 and 21.6 per cent. respectively. In the case of the extra-London municipalities the high figure is due largely to a number of important industrial districts on the fringe of the County of London, *e.g.*, West Ham, Erith, Leyton, and Gravesend, which all have load factors above 28 per cent. West Ham is the highest in the list at 30.6 per cent.; the nearest approach to this by the companies is 24.6 per cent. in the case of the Slough and Datchet Co. The lowest municipal load factor was at Ealing (14.2 per cent., including the works load); the Tottenham District Light, Heat & Power Co. showed only 10.7 per cent.

The analysis of the distribution of the energy sold only makes one point clear: that is, that the energy supplied for street-lighting purposes increased from 21,000,541 kWh to 25,653,231 kWh. This is a noteworthy addition to a branch of the industry which, apart from its intrinsic value, is an excellent advertisement of electricity.

The form in which the returns are presented leads inevitably to comparisons between the efforts of companies and local authorities. It is seen that the local authorities made net extensions of 80,610 kW (generating and transforming) during the year, and expended £2,963,487, while the companies spent £945,026 and added 53,913 kW to their plant. The two principal items of expenditure were as follows:—Land, buildings, plant and machinery: Municipalities £1,917,362, companies £467,548*; mains, services, meters, &c.: Municipalities £976,863, companies £496,966*.

The amalgamated capital accounts of the municipal-authority undertakings show a total sum raised by loan of £16,218,379; this has been overspent by £264,788, and a total of £9,870,888* represents the amount of loan remaining unredeemed at the end of the year. The companies have spent a total of £24,346,313 (total capital called up £21,078,111*).

The gross profit earned by the municipal authorities was £1,950,888, and that of the companies £3,212,113. Assuming that this was earned by the total capital expenditure in each case, *i.e.*, including capital represented by obsolete plant, &c., that has not been written off the capital account, the gross returns were 11.83 per cent. in the case of the local authorities, and 13.19 per cent. for the companies. The ratio of working costs to revenue in the case of the local authorities was about 51 per cent., and in the case of the companies about 42 per cent.; in both cases rates and taxes are not included. The gross profit per kWh sold was:—Municipalities 1.30d.; companies 1.93d.

An analysis of the capital of the 44 companies dealt with shows that it is divided as follows:—Ordinary shares 33.3 per cent., preference shares 26.2 per cent., and loan capital 31.2 per cent. The dividend on the ordinary shares for 1922 varied from nil to 20.3 per cent., the "overall" dividend being 10.65 per cent.* The average return on the preference shares was 5.75 per cent.* The average rate of dividend and interest for 1922 was 7.22 per cent.*, this comparing with 6.30 per cent.* in 1921.

Following the usual practice a table is published showing the average rates of dividend and interest for each of the London companies from 1899 (or their inception) to 1922. In one case (the City undertaking of the Charing Cross Co.) there was a fall below the 1920 figure—from 3.86 to 3.84—but in every other instance the dividend was the highest in the history of the undertakings. The greatest increase occurred in the dividend of the Chelsea Electricity Supply Co., Ltd.—from 5.62 to 8.28 per cent. That of the South London Electric Supply Corporation, Ltd., rose from 6.31 to 8.79 per cent. The highest average dividend was that of the Notting Hill Electric Lighting Co., Ltd., which was 13.41 per cent., as compared with 12.05 per cent. in 1921.

Twelve pages of the report are devoted to a consideration of charges. There are 22 distinct systems comprising flat rates, sliding scales, and various forms of two-part charges. As stated in our last issue the flat rate for lighting ranged between 4d. (at Hendon) and 1s. (at Sevenoaks, Caterham, and Leatherhead) per kWh. Comparing the charges with those for 1920-21, it is observed that in the great majority of cases reductions were made. These, as a rule, were ½d. per kWh, but there were several 1d. reductions, and as much as 2d. was taken off in three or four instances. The average lighting flat rate in 1921-22, for 83 undertakings, was 7.17d. per kWh, as compared with 7.64d. per kWh (77 undertakings) in 1920-21. The power flat rates of 76 undertakings varied between 1d. (St. Pancras) and 7d. (in six instances) per kWh, the average being 3.2d. (approximately). In the preceding year the average rate, for 69 undertakings, was 3.6d. approx.

The flat rate for heating and cooking ranged from 1d. per kWh (in 7 places) to 6d. per kWh (in 3 places), and the average for 83 undertakings was 2.42d. per kWh, comparing with 2.76d. per kWh in the preceding year, for 74 undertakings. It is impossible to deal with the other 19 methods of charging in any form of summary and, even then, the ultimate effect of these would be untraceable. If the undertakings employing the flat rates dealt with above may be taken as typical of the whole it is seen that the average reductions expressed as percentages were as follows:—Lighting 6.15; power 11.11; and heating and cooking 12.32. It is to be noted that in the lists of flat rates in cases where an undertaking has no definite flat rate but employs sliding scales the first steps of the latter are given. Judging merely from the flat rates the cheapest all-round supply would appear to be that at St. Pancras—lighting 4½d., power 1d., and heating and cooking 1d. Hackney is a close second with charges of 5d. for lighting, 1½d. for power, and 1d. for heating, although there are a number of other municipal undertakings at practically the same levels. The best company prices appear to be those of the Westminster Electric Supply Corporation: Lighting 5½d., power 1½d., heating and cooking 1½d.

The copious notes with which the tables of charges are provided reveal a number of unusual practices. For instance, at Leyton, under the prepayment meter system (8d. per kWh), a 30- or 50-W m.f. lamp is given for every 50 kWh consumed. The Barnes undertaking has a contract tariff system by which the applicant declares the maximum number and size of lamps intended to be used at one time. The accounts are paid in advance, calculated at 3d. per week per 20-W lamp; there is accordingly no metering. At Willesden the maximum demand system of lighting is based on "three units per quarter for each 33-W lamp simultaneously alight." Woking classes public houses with theatres and kinemas for a special lighting rate.

The report is the fruit of much labour, and the way in which the information is classified is excellent when it is borne in mind how diverse are the systems of accountancy, works recording, charging, &c., employed by the 88 undertakings dealt with.

* Figures based on incomplete returns.

Economic Conditions in South Africa.

A REPORT on this subject has been presented to the Department of Overseas Trade by Mr. W. G. Wickham, Senior Trade Commissioner in South Africa.*

This states that the latest annual statistics of production cover a period rather more than a year earlier than the statistics of trade, and refer to 1922. The figures relate to the slump period following the post-war inflation, and give a general idea of the effect of deflation on local industry. Detailed examination is hardly worth while as conditions have since completely changed; the industrial position equally with that of commerce has very materially improved, and even if there have been no startling developments in expansions and starting of new industries, the figures for 1923-24 production are likely to show greater prosperity.

Imports.

The total value of imports during 1923, exclusive of specie and Government imports, was £54,400,000, as compared with £47,250,000 in the preceding year. While the share of the United Kingdom increased in value, the proportion of the total fell from 54.2 to 52.1 per cent. The American share was slightly higher, and that of Germany smaller. Germany, while losing ground on the whole, obtained increased trade in certain lines. In many directions the pre-war level was re-gained, and although the recovery in general was very slight, almost all classes of electrical goods and machinery reflected increased German trade. The American share of the imports of electrical machinery rose by £93,000, and a percentage gain was made in the case of electrical primary batteries. Among the new headings in the import list is "wireless apparatus," most of which was supplied by the United Kingdom.

Minerals.

The coal mining industry had a record year, and the report states that the large power station which it is intended to erect at Witbank should still further cheapen production, while the electrification of the railways to the coast should materially affect the more important factor in coal export, railway freight rates. Asbestos production is expanding in the Union, as well as in Rhodesia. The mining of chrome ore, which has increased in recent years to an important scale, should be materially helped by port improvements at Beira. Copper mining in the Union has been revived with Government assistance; and reports from Northern Rhodesia state that before long production in British territory may be on a scale competing with that over the border in Katanga. Lead production in the Union is small compared with that of Northern Rhodesia, and, like tin, is somewhat patchy, rendering mining speculative and production very variable from year to year. The production of corundum valued at £22,000 was considerably above the average. The production of osmiridium figured at 1,784 fine ounces. Mica made a very insignificant showing in the Union figures. There appear to be good prospects of Rhodesia's becoming an important contributor of this important mineral. The discovery of platinum was recently reported.

Electrical Development.

The past 12 months have brought the Union a long step forward in the direction of co-ordinate power production in large units. The power station at Colenso in connection with electrification of the Pietermaritzburg-Glencoe section of the Natal main line is nearing completion†; more than half should be in operation this year. Negotiations are in progress in relation to superpower stations at Capetown, Durban and Witbank, each of which will probably be linked up with existing municipal power stations and obviate the necessity of separate expansion. The Witbank station will be closely related to the existing plant of the Victoria Falls Power Co., to supply the gold mining industry and the Transvaal coal fields.

The Post and Telegraph Department is installing first units of automatic telephones at Port Elizabeth and Pietermaritzburg. The long-distance radio station near Capetown is in process of erection by Marconi's, and, finally, broadcasting has already developed into a universal hobby, licensees from the Government having at various important centres installed plant and completed their organisation for broadcasting concerts and distributing news.

General.

The legislative session began in January last with prospects of a considerable amount of important legislation, including some revision of the tariff, but a general election intervened and not very much of commercial or industrial importance was carried into law. The Industrial Conciliation Act was contested in all its stages before being passed into law. It is hoped that this Act will provide the machinery for peaceful settlement of industrial problems. The objections to and failure of compulsory arbitration are fully recognised, and this measure is an attempt to provide an alternative.

The Post and Telegraph Department has been able to write off a deficit and show a profit, and there is hope of a reduction of postal rates to a normal level.

Southern Rhodesia.

An appendix containing notes on the trade of Southern Rhodesia is provided by Mr. F. Fisher, Imperial Trade Correspondent at Bulawayo. In this it is shown that the imports of electrical machinery and fittings rose from £40,629 in 1922 to £51,537 in 1923. The exports of blister copper declined in value from £415,470 to £323,727, and those of raw asbestos rose from £287,744 to £469,026.

* Stationery Office. Price 1s. 6d. net.

† This line has now been opened for traffic (*vide* ELECTRICAL REVIEW, November 14th, page 746).

The Electrical Imports of New Zealand.

THE following table shows the values of electrical and allied goods imported into New Zealand in 1923, according to the recently-issued official trade returns. The figures for 1922 have been given for purposes of comparison, and notes of increases or decreases added:—

	1922.	1923.	Inc. or dec.
	£	£	£
Electric batteries and cells—			
Total	49,000	88,000	+ 39,000
From United Kingdom ...	15,000	23,000	+ 8,000
,, United States	31,000	49,000	+ 18,000
,, Canada	2,000	—	– 2,000
,, Denmark	—	2,000	+ 2,000
Generators, motors and transformers—			
Total	273,000	352,000	+ 79,000
From United Kingdom ...	180,000	221,000	+ 41,000
,, United States	80,000	94,000	+ 14,000
,, Sweden	10,000	10,000	—
,, Canada	—	11,000	+ 11,000
Insulated cable and wire—			
Total	229,000	460,000	+ 231,000
From United Kingdom ...	210,000	325,000	+ 115,000
,, United States	9,000	17,000	+ 8,000
,, Canada	—	14,000	+ 14,000
,, Australia	1,000	13,000	+ 12,000
Electric lamps (incandescent filament)—			
Total	71,000	85,000	+ 14,000
From United Kingdom ...	39,000	55,000	+ 16,000
,, Netherlands	17,000	21,000	+ 4,000
,, United States	13,000	6,000	– 7,000
Other electric lamps—			
Total	7,000	12,000	+ 5,000
From United Kingdom ...	1,000	2,000	+ 1,000
,, United States	4,000	8,000	+ 4,000
Carbons in blocks—			
Total	37,000	34,000	– 3,000
From United Kingdom ...	17,000	15,000	– 2,000
,, United States	11,000	11,000	—
,, Australia	1,000	1,000	—
,, Canada	—	6,000	+ 6,000
Other electrical material—			
Total	371,000	419,000	+ 48,000
From United Kingdom ...	226,000	223,000	– 3,000
,, United States	83,000	148,000	+ 65,000
,, Japan	4,000	1,000	– 3,000
,, Australia	6,000	8,000	+ 2,000
,, Belgium	27,000	—	– 27,000
,, Canada	23,000	31,000	+ 8,000
Electricity meters—			
Total	33,000	44,000	+ 11,000
From United Kingdom ...	25,000	39,000	+ 14,000
,, Switzerland	2,000	—	– 2,000
,, United States	3,000	2,000	– 1,000
Recording and testing instruments for meters—			
Total	32,000	51,000	+ 19,000
From United Kingdom ...	21,000	37,000	+ 16,000
,, United States	7,000	11,000	+ 4,000
Telephones and accessories—			
Total	153,000	239,000	+ 86,000
From United Kingdom ...	20,000	56,000	+ 36,000
,, United States	19,000	44,000	+ 25,000
,, Sweden	5,000	1,000	– 4,000
,, Belgium	109,000	34,000	– 75,000
Iron telegraph and telephone wire—			
Total	6,000	12,000	+ 6,000
From United Kingdom ...	6,000	12,000	+ 6,000
Gas, oil, and hot-air engines, exceeding 100 b.h.p.—			
Total	10,000	15,000	+ 5,000
From United Kingdom ...	5,000	13,000	+ 8,000
,, Sweden	4,000	1,000	– 3,000
Steam engines, stationary, exceeding 200 b.h.p.—			
Total	19,000	16,000	– 3,000
From United Kingdom ...	17,000	16,000	– 1,000
,, United States	1,000	—	– 1,000
Turbines, steam and water, and Pelton wheels, exceeding 200 b.h.p.—			
Total	20,000	89,000	+ 69,000
From United Kingdom ...	12,000	83,000	+ 71,000
,, Switzerland	7,000	2,000	– 5,000
,, Sweden	—	4,000	+ 4,000

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

A Self-contained Electrical Measuring Set.

An instrument combining the usual functions of a Wheatstone bridge with a greatly increased speed of operation and general practical convenience, is made by the INDIA RUBBER, GUTTA PERCHA & TELEGRAPH WORKS CO., LTD., Silvertown, E.16. The instrument is entirely self-contained and ready for use at any time; moreover, it can be used by unskilled persons having no knowledge of the technicalities of the Wheatstone bridge. The arrangement of the index and ratio switch make it impossible to obtain a false value for the resistance under test.

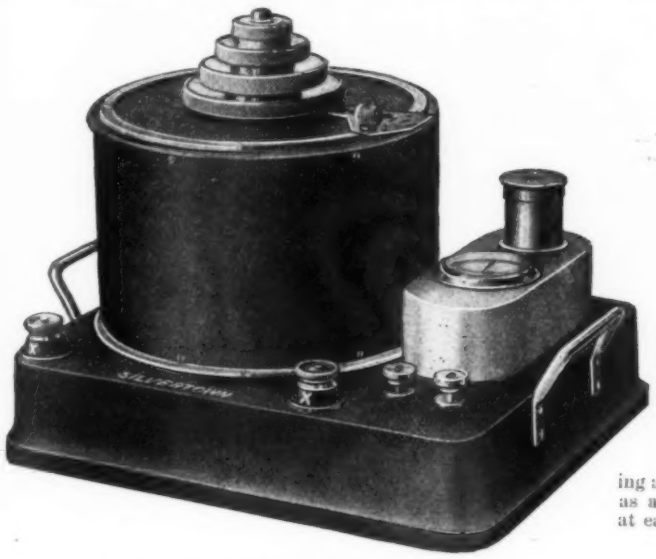


Fig. 1.—A Self-contained Electrical Measuring Set.

The general arrangement of the instrument is shown in fig. 1. The adjustable arm of the bridge consists of four semi-rotary switches connected to four concentric handles to which are fixed segmental index plates bearing figures 0—9. These figures are arranged to show through a window and indicate the value of the resistance in a straight line, thereby avoiding confusion. A ratio switch knob is provided adjacent to the index figures and carries a pointer to show the position of the divisor or multiplier. In the standard instrument the ratio may be set to read directly or to divide by 10 or 100 or multiply by 10 or 100. The arrangement of the adjustable switch handles and ratio knob being adjacent greatly facilitates operation as they are all under the control of one hand which need not be moved from place to place. A suspended moving coil galvanometer provided with external zero adjustment is mounted by the side of the adjustable rheostat. This galvanometer is made as a separate unit and is of robust construction. The method of suspending the light moving coil prevents damage to the suspensions and obviates the necessity of levelling, and the instrument provides a very sensitive current indicator, there being no pivot friction. Two key knobs are provided in front of the galvanometer, one marked B for closing the battery circuit and the other marked G for the galvanometer. The latter key is provided with double contacts and, when partly depressed, closes the galvanometer circuit through a resistance, preventing excessive currents passing the galvanometer and, when fully depressed, the resistance is cut out, giving maximum sensibility.

The adjustable rheostat, galvanometer, keys and terminals are all mounted on a metal base which serves to contain the two keys, the ratio switch and the dry battery. A removable cover plate on the bottom of the base gives access to the battery compartment for replacing a used battery. The battery is of a standard type and dimensions, giving 6 volts.

"Rowenta" Electrical Appliances.

About a year ago the WELSBACH LIGHT CO., LTD., 344-354, Gray's Inn Road, W.C.1, commenced the sale of electrical appliances under the trade name of "Rowenta." The department has recently been developed and the company has now available a complete range of domestic appliances as well as lighting fittings in great variety. Many of these appliances are fitted with a "universal" voltage arrangement consisting of three terminals, by means of which the appliance can be adapted for the following ranges of pressure: 100/125-V, 150/160-V, and 200/250-V.

The toasted illustrated in fig. 2 is an example of the application of this arrangement. This appliance has a well-constructed frame of highly-polished nickel-plated brass. Both sides of the toaster are employed and each side is fitted with a detachable door. The heating elements consist of best quality resistance wire wound on four heavy mica strips giving a large heating area. The loading is 440 W. The top acts as a warming plate, and a wicker-covered handle is fitted at each end of the appliance.

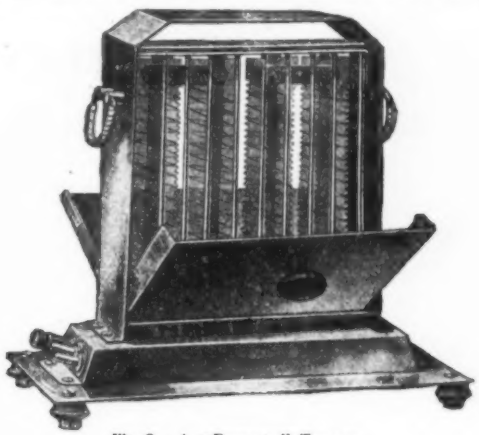


Fig. 2.—A "Rowenta" Toaster.

Tucker's B.E.S.A. Plugs and Sockets.

MESSRS. J. H. TUCKER & CO., LTD., King's Road, Tyseley, Birmingham, have produced a range of 15-A plugs and sockets conforming in every respect to the requirements of British Standard Specification No. 73. The sockets are made in three patterns, *viz.*, surface type (with china or hardwood cover), floor type (with brass flange), and sunk type (for switchplate mounting). The terminals are of the side-screw type and the wires enter from the rear. The socket tubes are provided with a series of "C" springs produced by slotting the originally solid contact tube. When the plug pins are pressed home the tongues spring out and grip the pins all round. Adequate and simple fixing facilities are provided, and the porcelain used is high-grade English vitreous porcelain. To fully meet the Specification a hand shield is necessary. This is provided, but two other patterns of plug are also made—with a china cover (as illustrated in fig. 3), and with a hardwood cover. The plug terminals are of the top-screw type, mounted on black fibre disks in the firm's usual manner. The pins are of heavy section and slotted. The cable entry holes are on the sides of the plug so that the wires do not pass through the hand. A special feature is the large hole for cab-tire or other large cable in a single covering on the one side, and two separate holes for twin flexibles on the other (this alternative arrangement is patented).

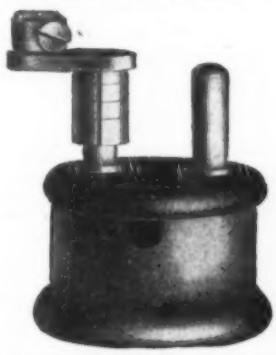


Fig. 3.—New Tucker 15-A Plug and part of Socket.

Free Cookers Suggested.—At the monthly meeting of Accrington Trades Council and Labour Party, on November 20th, the question of the introduction of free cookers for dwelling-houses was discussed, and the Accrington and District Gas Board and the Corporation Electricity Committee were asked to consider the advisability of installing free heating and cooking appliances to encourage the greater use of gas and electricity.

The "A.R." Air-Filtering Plant.

An Interesting French Product.

THE diversity of patterns of air-filtering apparatus on the market is an indication of the demand for a satisfactory device of this sort. An interesting filter, for the details of which we are indebted to M. Paul Dieny, M.S.E., M.Soc.C.E. (France), is the "A.R." plant, of which there are 15 installations in use in this country for heating and ventilating purposes; eleven in connection with cooling pipe-ventilated electric motors, and one for the collection of ebonite dust. In France and Belgium there are over 1,500 sets of such plant in successful operation for heating and ventilation, while over 200 have been installed in conjunction with turbo-generators and turbo-compressors.

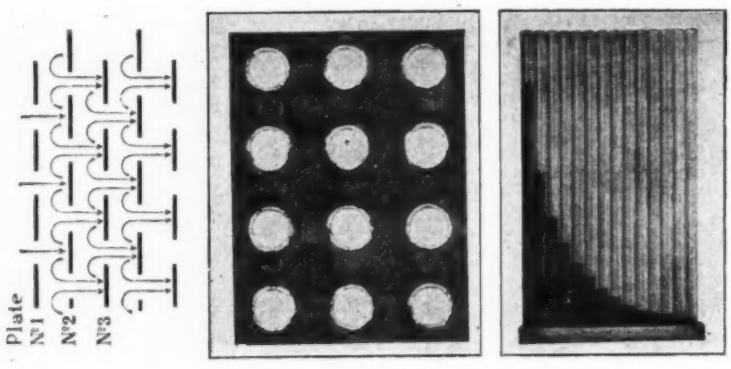


Fig. 1.—The "A.R." Filter, Plate, and Dust Deposition.

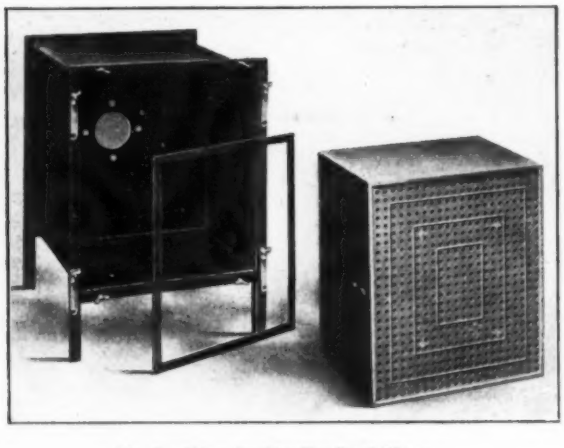


Fig. 2.—Filter for Pipe-Ventilated Motor.

The accompanying illustrations show the principle on which the filter operates and the manner in which it is made; fig. 1a shows the way the air passes through the filter; the dust settles on the plain parts of the plates, the holes remaining always free air passages. Fig. 1b is a portion of a plate which is covered with a sheet of wadding, chemically treated and rendered non-inflammable; to hold the wadding in place the burr round each hole is turned over in a similar way to bootlace eyelet holes. Fig. 1c shows how the air is purified from plate to plate, forming on the last one a dust deposit about 100 times smaller than that on No. 2 plate. Fig. 2 illustrates a filtering element and its frame, the clean air passing through the hole at the back for some such application as to a pipe-ventilated motor. A felt packing is utilised to insure airtightness between the units and the frame, and fig. 3 shows the manner in which a number of elements are assembled to form a large unit. Being made of aluminium, the elements are light and easy to handle; no attention is required during operation and the maintenance cost is practically nil. Cleaning the filter is simple, and when done by hand each element takes two or three minutes, but for a large plant consisting of 50 or more elements a mechanical shaker, fig. 4, is provided; no dust can escape, it being collected in a hopper at the bottom and removed as required.

Naturally such an air filter has a very wide application, but one of the largest is probably the cleaning of turbo-generator cooling air. Fig. 5 shows the plan and section of one of two sets of filtering plant in use at the St. Ouen power station near Paris; each consists of 320 elements passing 74,200 cu. ft. of air per minute, serving a 35,000-kW turbo-alterantor.

It will be appreciated, of course, that no filtering medium is used, neither water, oil, nor any other viscous product; the air passing through a hole impinges against the next plate, the dust deposits itself and the process is repeated on each successive plate. Fig. 1c represents glass tubes filled with the dust collected on each successive plate; it shows the filter to be scientific in its operation and that its efficiency depends solely on the number of plates in series.

Four types of filter are manufactured, differing simply in the number of perforated plates used in series:—Type A.R. 7 (7 plates) is used for cleaning the air for large buildings, power stations, workshops, storerooms, &c., where good cleaning is required and large capacities are to be dealt with. (Type 7 can be compared for efficiency with the standard type of air washer.) Type A.R. 10 (10 plates) is used when better filtering efficiency is required and numerous applications have been made for the ventilation of offices, for kinemas, theatres, &c.

Fig. 3.—Assembling Elements in Frame.

Fig. 4.—Cleaning Elements in Shaker.

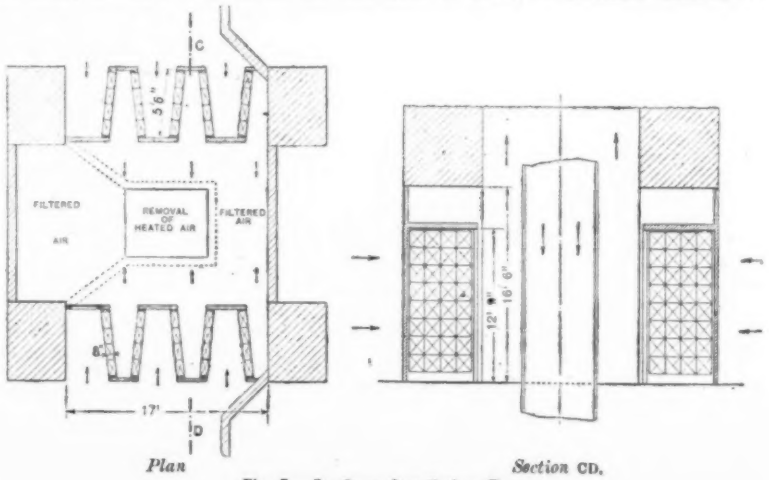


Fig. 5.—St. Ouen Installation, France.

Type A.R. 15 (15 plates) is recommended when thorough cleaning is required.

A "super filter" has been placed on the market, consisting of a Type A.R.10 filter, followed by a cloth filter of very fine fabric, and has been supplied for operating theatres, scientific laboratories, photographic plate and film manufacturers, special drying processes in the perfume industries, drying of electric transformers, &c.

The following guarantees are given:—(1) Non-inflammability, rust-proof. (2) With Type A.R. 7 the filtered air will contain only 0.3 milligram of dust per cu. metre of air. With type A.R. 10 a filtering efficiency of 92 per cent. or the filtered air will contain only from 0.1 to 0.2 milligram of dust per cu. metre of air. With Type A.R. 15 a filtering efficiency of 98 per cent. or the filtered air will contain only from 0.05 to 0.1 milligram of dust per cu. metre of air. With the super-filter the filtered air will contain only 1/100 milligram of dust per cu. metre of air. (3) That *after six months' operation without cleaning*, the air resistance will have increased by 1 mm. only, insuring a practically constant volume of air, which is of great importance for ventilating purposes. In the super-filter, of course, the air resistance increases with the deposit of dust on the cloth filter.

Indian Electrical Progress.

(From a Special Correspondent.)

THE advantages of electricity are being increasingly recognised in India and electricity supply companies are being started everywhere. The latest venture in this respect is the Agra Electric Supply Co., Ltd., started with an authorised capital of Rs. 15 lakhs under the management of Messrs. Martin and Co., Calcutta, who have already successfully worked the United Provinces Electric Supply Corporation. The company proposes to supply electric power within the municipal and cantonment limits of the City of Agra, which has a population of about 200,000. The Municipality has already expressed its willingness to take a supply from the company for its own purposes, such as the lighting of streets, while negotiations are proceeding with the B.B. & C.I. Railway Company, the military authorities and the Government Post and Telegraph Department and other bodies, for the supply of electricity for their requirements. A large demand is also reasonably certain from the bazaars, private residences and business premises, as well as from the large number of small factories in Agra. The authorised charges for energy are 8 annas per kWh for lighting, fans and heating purposes, and Rs. 10 for power per mensem per kW connected, plus 2¼ annas per kWh. Special rates will be arranged for large and continuous consumers.

It is proposed to lay down one 270-kW and one 150-kW set at once, and a further 270-kW set as soon as the station load reaches 150 kW. This will allow for a load of 400 kW, which should be obtained in the third year of the company's working. The energy to be sold in the third year of working should be about 800,000 kWh. On this basis the profit per annum should be Rs. 90,000. Thus after three years' working there is every reasonable prospect of the company's yielding a return of 8 per cent. per annum on the invested capital. The company's consulting engineers are Messrs. Handcock and Dykes, London, who will test and pass all machinery and material required by the company before shipment.

Besides the Agra scheme there are a number of other projects maturing. In the Madras Presidency a company has been formed, of which Messrs. Subbarao Pantulu and Co. are the managing agents, to provide electricity in the town of Rajahmundry. In the Punjab also it is expected that Multan and Rawalpindi, and possibly Lyallpur, will shortly be supplied with electric power. The electricity supply scheme of Jullundur is maturing and much needed improvements are being made or are contemplated in the existing systems at Lahore and Amritsar.

From a report recently published it appears that the Mac-Lagan Engineering College, in the Punjab, for the training of electrical engineers, which was opened about a year ago, has been progressing very well. The Government of the United Provinces has also decided to convert the technical school of Lucknow into an electrical engineering college.

The results of the working of the Bengal Telephone Corporation, Ltd., for the year ended June 30th, 1924, showed a net profit of Rs. 3¼ lakhs, after providing for depreciation, sinking fund, &c. Dividends have been declared at the rate of 7 per cent. on the preference shares and 3 per cent. on the ordinary shares. The number of telephone stations increased in the year from 8,894 to 9,059. Since the close of the year the Government of India has sanctioned a message rate.

Venezuelan Radio Apparatus Concession.—*Commerce Reports* states that an exclusive concession, under Government supervision, to import, sell, rent, and establish in Venezuela apparatus for radio concerts has been granted, by Executive Decree, to Col. Arturo Santana.

The "Princeps" Clock.

AT the British Horological Institute, Northampton Square, London, on November 19th, Major C. E. PRINCE, O.B.E., M.I.E.E., gave a lecture on "Some Recent Developments in Electrical Clocks."

Major Prince; who was introduced by the President of the Society, Mr. F. Hope-Jones, M.I.E.E., said that in the case of ordinary clockwork mechanisms the pendulum worked the recording apparatus, causing an appreciably rapid loss of motion which had to be restored by impulses, which, being given by means of the clock wheels, were liable to affect the timekeeping properties. Electric clocks had separate recording apparatus which did away with mechanical connection. The ideal of the clockmaker was the free pendulum, and in the "Princeps" clock invented by the speaker this ideal was attained as nearly as possible. A conductive pendulum was suspended from a steel spring, and in its motion light'y touched two side springs. By means of a special polarised

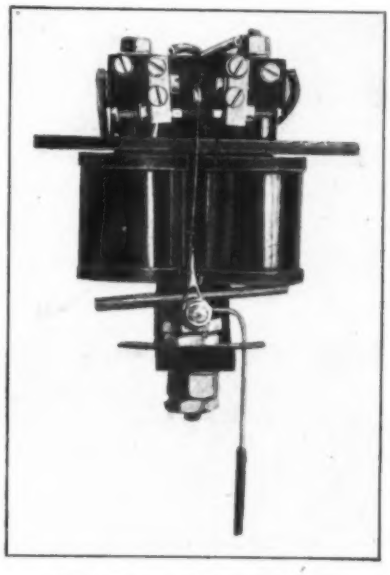


Fig. 1.—The "Princeps" Reverser.

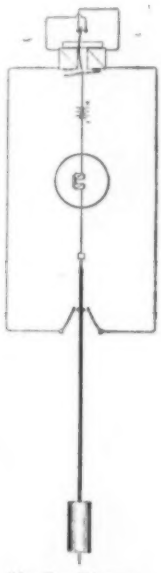


Fig. 2.—Diagram of the "Princeps" Clock.

electromagnetic relay, known as a reverser (fig. 1), small continuous impulses were given to the pendulum through the agency of the side springs. The actual breaking of contact, however, was not performed by the springs, but by a rocking armature and flexible contactor, thus preserving the pendulum rod from the effects of sparking. The arrangement of the wiring is shown diagrammatically in fig. 2. The lecturer demonstrated the action by an ingenious arrangement in the slide space of a lantern, the shadow of the movement being thrown upon a screen.

The method of providing a continuous series of impulses was considered to be superior to the system of giving large impulses at longer intervals; the inevitable loss of motion was restored imperceptibly and smoothly.

To show the near approach of the "Princeps" pendulum to the free pendulum, Major Prince exhibited diagrams showing the gradual loss of amplitude. The free pendulum was seen to lose .02 per cent. per vibration, while the decrement of the "Princeps" pendulum was only one half of one per cent. greater than this. A diagram of the action of a "Princeps" pendulum driving a count wheel was also shown, and this clearly demonstrated the effect of burdening the pendulum—a rapid loss of amplitude.

The lecturer said that to minimise sparking condensers were being employed at appropriate points, and, also, it had been found that gold-silver contacts were far superior to platinum. The clock was designed to work on 4-V; the working current was 50 mA, and therefore the consumption was extremely small.

Since the impulses given marked the seconds, relays could be arranged to transmit these to secondary dials. By a simple adaptation of the mechanism half-minute impulses could be arranged for.

One use which could be found for the clocks was the recording of the periods of faults in mains. Two clocks could be placed in synchronism, connected by interlocking relays, and so arranged that one would stop immediately a fault occurred, while the other stopped upon the re-establishment of the current.

Another application of the mechanism was in connection with turret clocks. A toy motor was shown driving a clock by means of impulses given by a master clock, while it automatically compensated itself for variations of supply or load.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

British Municipalities and Foreign Electrical Plant.

In your issue of November 21st you were good enough to publish an article in which I criticised the policy of certain British municipal electrical engineers in placing their orders abroad. I endeavoured to state the case as fully as possible from the manufacturers' point of view and was hoping that the article would draw replies giving the views of those corporation engineers whose opinions and practice had been subjected to criticism.

As none of them have come forward I trust it may be inferred that the case I made out is worthy of serious consideration and cannot lightly be brushed aside. If this should be the case my object has been fully achieved.

The only opposition I have to deal with is the letter by "Salesman" in your last issue and I am grateful to him for stating the case for the other side.

His first point is that if British municipalities were to insist in all cases on buying British plant, their market would be a happy hunting ground for rings and combines. In making this assertion he neglects the following considerations:—

(1) When the sale of a given article becomes unduly profitable fresh competition inevitably springs up so that there is a very definite limit to profiteering through rings and combines.

(2) In countries where manufacturers are protected by tariffs it is not found that the consumer is entirely at the mercy of the supplier.

(3) Owing to the individualistic character of British industry it is very difficult to find any ring or combine which embraces the whole of the manufacturers in that particular branch.

(4) There is no eye-wash about the poor financial results of many electrical manufacturing companies, and it is, therefore, perfectly true that manufacturers would like to raise their prices, not artificially, but because of the practical desirability of doing this. It is the hope of reward which stimulates labour, enterprise and the flow of capital in any industry. If "Salesman" really is a salesman he ought to understand this perfectly well.

"Salesman's" next point is somewhat intriguing. He tells us that facts have been given to him which may be useful to a future Royal Commission on the subject. I wonder what awful secret he has unearthed. Is it the fact that Santa Claus does not really come down the chimney with the children's toys, or is it that he has discovered a British manufacturer quoting a lower price for export than for the home market? I have a strong suspicion that he has made one or other of these discoveries, possibly both; but, for his general information I would point out that any Royal Commission which is likely to be appointed by the British Government will be fully aware of the considerations which sometimes make it desirable for a firm to keep its works going and its labour from being disseminated by taking on work on occasions at prices which merely tend to reduce overhead charges and, but for other more remunerative orders, would be a definite loss. The case is analogous to that of a man with a large family to keep, earning £3 a week by working 47 hours and doing other work in his spare time which brings him in a little extra money but at a smaller rate of remuneration for the time expended.

If I have not divined the particular practice which "Salesman" thinks it worth while to bring to the notice of a Royal Commission, may I suggest that he discloses it through the medium of these columns? If it is a bad practice, it is surely to the interest of the industry as a whole that it should be exposed without delay.

"Salesman" attributes ignorance on my part of the existence of such countries as the U.S.A., Sweden, Holland and Switzerland. I hope he will accept my assurance that I have not only learnt of the existence of these countries through a study of geography, but have even visited them and know something about their industry, methods, fiscal arrangements and labour conditions.

With the exception of Holland which has no electrical industry worth speaking about, the countries in question all protect their industries partly by tariffs and partly by other methods which are too involved to go into on the present occasion. "Salesman" should, therefore, not be so ready to ascribe the ability of these countries to dump their surplus products to superior organisation, but should bear in mind that they have a secure home market which British electrical manufacturers have about as much chance of invading as the proverbial snowball had of retaining its spherical shape in a certain hot place.

Manufacturer.

November 28th, 1924.

It is seldom one comes across an article so full of complacent self-interest and fallacies as that by "A Manufacturer" on "British Municipalities and Foreign Electrical Plant" in your last issue. Perhaps you will permit a few observations on it?

The interesting analysis of the £1,000 job sent abroad looks impressive, and one can almost see those poor 266 persons getting sacked and going on the dole. Two ideas occur which diminish the emotional value of this argument:—

(1) Things don't work out like that in practice. The value of the Newport job was £30,000, approximately. Even "A Manufacturer" will scarcely assert that 30×266=7,980 engineers were suddenly added to the list of dole-hunters by the placing of the Newport contract in Switzerland. When British firms compete for a municipal job and one gets it, the unsuccessful manufacturers do not as a rule indulge in lachrymose homilies on the number of their workers about to go on the dole; nor, as a rule, do the workers go. To introduce such observations when the successful tenderer is Swiss savours of a display of what our American cousins call "sob stuff."

(2) We are told daily that the root cause of our unemployment problem is the loss of foreign markets as a result of the war, and that a revival of overseas trade is the remedy. The action of Newport will tend to encourage this revival, for it is a truism of commerce that exports pay for imports. So England will pay Switzerland for the Newport plant, not with 30,000 golden sovereigns, but with goods. If, therefore, the placing of Newport's order abroad means the placing of 30×266 mechanics on the dole, it also necessitates the removal of 30×266 weavers in Bradford, shall we say, off the dole to manufacture the cloth exported in payment of the Swiss plant; and, in addition, there is the shipping activity involved in the transportation of goods to and from this country. The burden of the dole is thus diminished rather than increased.

Not being a municipal engineer, I do not know what they will think of the suggestion that they should be *compelled* to buy British goods. Chained to the manufacturers' chariot, it is conceivable that prices to them might be higher still. It is true engineers are willing to pay a bit more for a machine because it is British, to pay extra for the convenience of having the maker on the spot for repairs, and so on; but when it comes to being asked to pay nearly 50 per cent. more, then the engineer is justified in remembering that ratepayers have interests as well as manufacturers. As it is, Newport will get a machine to supply the required kVA, and still have £13,000 in hand for additional projects. Had a British tender been accepted, Newport would have got a machine to supply the required kVA as before, but the additional projects could not be carried out because £13,000 had been expended on an abstraction. This may be splendid sentiment, but it is not business. Because it is backed by ratepayers instead of shareholders is no reason why a municipality should not be conducted on commercial lines. No doubt it would be very nice from the manufacturers' point of view to place them on the same level as the Admiralty and War Office. "Government supplies" have made many fortunes. It is well to note that warships and guns are made at home for reasons that have not the remotest connection with commerce. Such cannot be said of the trading departments of municipalities.

A. Morris.

Birmingham, *November 26th*, 1924.

A "New" Single-phase Motor.

It is a commonplace of experience that inventions are constantly re-invented, but it is seldom that such a striking case is brought to one's notice as that of the alleged new type of single-phase motor dealt with by Mr. S. R. Bergman in the *Journal* of the American I.E.E., page 599, July, 1924. If readers of the description of this "new motor" will refer to page 287 of Vol. LVII of the *Journal* of the I.E.E., they will find that even then it was an old type of machine. As a matter of fact, several of these machines were made by the Crypto Electrical Co., for which I was acting as designer about 1904. One of them was supplied to drive a fan somewhere in the City of London—where it may still be at work for anything I know to the contrary. I find that I still have the winding calculations and that the machines on test behaved very well.

In case any English manufacturers should be interested in this type of machine, which certainly has excellent characteristics for certain purposes, I thought it might interest them to know that it is apparently open to all the world. The only addition to the original idea appears to be Mr. Bergman's commutation strip.

Wm. Cramp.

Birmingham, *November 27th*, 1924.

Trade Discounts and Direct Trading.

It is time that electrical dealers were doing something to protect themselves against price-cutting by British manufacturers.

Very recently I quoted against an inquiry for a 3-h.p. electric motor. The small profit of 30s. which I added to what the manufacturer's representative assured me was a very keen price would, I thought, assure me of the order. In the usual way I followed up my quotation with a personal call on the following day, and you may imagine my surprise when I was informed that my price for the outfit was 30s. higher than another for the very same thing. As I had been of service to this particular client previously, I prevailed upon him to show me the other quotation, which

was an exact copy, from the manufacturer (one of our largest British manufacturers) whose estimate I myself had received. Naturally, I 'phoned up this firm immediately I returned to my office, and I was informed that they could not cover me for a single farthing. I pointed out that the user was a man in an extremely small way of business, but I was told that the firm had to keep prices down, even to the user, in order to secure business; nor could I prevail on them to offer a reduction of even 2½ per cent.

Now, I contend that the price quoted to a user, no matter in how big a way of business, should always be a margin more than that quoted to a re-seller. In this way one would have some encouragement to sell, knowing that a large market is open to one.

With regard to electric lamps, I, for one, would not dream of ever trying to make a livelihood from the sale of those of British manufacture. The discount of 15 per cent. and 5 per cent. allowed to the average seller could not be considered munificent, but when one considers the market open to the small dealer, the size of the discount fades into insignificance.

Before I came into the electrical trade I was employed as cashier by a firm who never, at any time, used more than one gross of lamps in the course of a season; yet this firm received *exactly the same* discount as an electrical contractor. Only yesterday I called on a firm who purchase about 300 per annum, and they told me, in confidence, that the discount allowed them on "ring" lamps was 25 per cent. and 5 per cent.

Even if, for the sake of securing other business, I were prepared to sacrifice my 15 per cent. and 5 per cent. to a user of, say, 100 lamps per annum, I am prohibited from doing so by the conditions of sales of all Association lamp manufacturers. This means, in short, that the "ring" is graciously pleased that the small dealer should pick up the crumbs that fall from its members' table. To crown all, these manufacturers accept innumerable small orders at net list prices, instead of advising the small buyers to purchase through a dealer.

In a recent issue of the ELECTRICAL REVIEW an advertisement appeared: "It is easy to sell British goods." So it is, perhaps—for the manufacturer.

Every time I send out an inquiry for electrical goods now I ask the manufacturer to quote his terms to a direct user. I would advise every one of your readers to do likewise, and refuse to deal with the firms who do not give them a fair crack of the whip.

Sell British and Starve.

Wiring Regulations.

As a reader for many years and a practical man working to-day, it makes me disgusted to read Mr. H. Wilson's remarks; if any employer of labour wanted men he would look for those 10-minute men, but he does not want to lose his trade. There are plenty of unemployed, and having had a lot of experience of supply engineers in the various districts, say, he would not be bothered. Technicality is one thing, practicality is another; but they will both blend, worked fairly for the benefit of the whole community.

Wm. Rowe.

London, *November 28th*, 1924.

Low-Temperature Carbonisation.

In your report of the address by Mr. F. W. Goodenough at the Manchester Smoke Abatement Conference, and my reply to him, the impression is given that my opinion is that further large-scale work will be necessary before low-temperature carbonisation of coal can be regarded as a commercial proposition. This was not my opinion, but was the view expressed in the quotation used by Mr. Goodenough.

My firm conviction is that low-temperature carbonisation has been proved a commercial success by the work done at the standardised plant at Barnsley, where thousands of tons of "Coalite" smokeless fuel have been made and marketed at good prices, together with valuable oils, for which products there is an almost unlimited demand.

The gas concerns rightly claim to have done something to abolish smoke, but after a century of high-temperature practice we are still plagued with the evil. Together the two systems can achieve the desired effect, and since there is ample scope for both, there is no need for rivalry if we really wish to improve the atmospheric conditions in our congested centres.

N. G. Thwaites.

London, *November 29th*, 1924.

The Contractor.

I have read with interest "Northern Contractor's" letter in your issue of last week. I quite sympathise with him, as I am in a very similar position.

I am a registered contractor within the Hackney supply area, where the municipal engineers have developed a mad progression during the past two years. This has developed to such dimensions that they make quite certain that none of the larger installations shall be executed by any contractor within their area, and during the past six months my firm has undoubtedly lost more than £300 in turnover through their intervention.

Contractors' premises have been likened to "mouldy cellars in back streets" by our municipal engineer (although two or three years ago his own showrooms and window show were exceedingly mouldy), and he makes it abundantly clear that he would very much like contractors to leave the district to him and his staff. The way he has on various occasions flung mud at contractors generally, and those within his area in particular, shows this.

His policy is to keep the price of the unit high, to enable him to spend £41,000 in building a palace for a showroom (which must be doomed to failure because of the gradual deterioration of property, the lowering of the class of the population, and the fact that at least one-half of the inhabitants already have electricity within their houses), and his pet theory is to give away on a lavish scale to get business.

I have read, for instance, in this paper how much improved his load factor has become by the hiring of his cookers, which are installed free and are hired and maintained for 5s. per quarter. I have no doubt that his figures are correct, but he is unbusinesslike enough to forget the ultimate cost of such improvement. Any fool can give away his commodities, but it takes a wise man to sell them, and I cannot help feeling that he would be wiser to calculate the cost of the cookers and installation of them, reckon the interest on, and the redemption of, capital thus sunk, and finally make quite certain that the profits through the improved load factor are paying this back. If so, he would then be level! I fancy, however, he would find that he would be very much indeed on the wrong side, with the consequence that the profits on the lighting unit at 5d. would have to pay very largely for the whole of this scheme.

If, however, he and his staff for the past two years had focused their progressive faculties on reducing the price of the unit all round to, say, 3d. for lighting and ¾d. for heating, he would not be able to connect up installations quickly enough by now. His contractors would have been easily able to live on the fruit of their work within their own borough, and he would have done a lasting good turn to consumers. He talks a tremendous lot about "free service," but he would do a heap more good by giving "free services."

The universal use of electricity for practically all purposes is a foregone conclusion, but if supply engineers are the "live" men that they accuse contractors of not being, they will strain every nerve in their anatomy, and make all their staffs do likewise, to make the price of current not only as cheap as, but cheaper than, either gas or coal; and then, and not until then, will their dreams be realised.

H. Linzell.

London, *November 24th*, 1924.

Wiring by Direct Labour.

Surely it is rather late in the day for your correspondent "Enterprise" to advocate the extension by municipalities of retail trading with regard to electrical installation work, as shown in your issue of the 14th instant. If it is a question of competition only, how can a private trader hope to compete with a rate-aided undertaking? How can he expect even a fair share of the business when the undertakers are necessarily first in the field?

Experience has shown, and the various Governments who have been in power since 1906 have admitted, that where the undertakers reserve their energies to supply, working in direct co-operation with the retail traders, the units sold per head of population increase very much more rapidly than where the sales department of the undertaking is either the sole link with the prospective consumer or is in active competition with the private trader.

May I conclude by pointing out that his "ounce of practice" has led "Enterprise" to conceive erroneous ideas, which would be entirely dispelled if he were to make a closer study of the subject.

Leonard G. Tate,
General Secretary,
The Electrical Contractors' Association (Incorp.)

London, *November 24th*, 1924.

Making Hay Without Sunshine.

With reference to the recent letters appearing in the "Correspondence" column of the ELECTRICAL REVIEW, on the subject of the artificial drying of hay, as one who saw a good deal of the experiments carried out in this direction, I should be glad if you would make some mention of what actually occurred in the matter of the history of the subject.

I have looked up my notes and find that my firm supplied apparatus for this purpose both to Mr. C. Tinker in July, 1919, and also to the late Mr. W. W. Hood in August and September, 1920. In the latter year, I also got out drawings for Mr. Hood, for an electrical pre-heater for the fan intake.

I am intensely interested in this subject from the farmer's point of view generally, especially as the application will be so useful in wet and mountainous countries; and as these are generally localities where cheap water power can be developed, I think there is a considerable opening in this direction for driving the fan and electrically heating the circulating air.

I have read with great interest the preliminary report published by the Ministry of Agriculture, and fully appreciate the value of the work which is being carried out by it at the Oxford Agricultural College. The practical solution of this problem is of inestimable value in a country like ours.

Wilfrid M. Harris, A.M.I.E.E.
GILBERT GILKES & Co., LTD.

Kendal, *November 24th*, 1924.

After reading Mr. B. J. Owen's letter to you in your November 14th issue, it occurred to me that it might interest him to know that my good friend, the late Mr. W. W. Hood, during his experiments at Invergeldie, Perthshire, about 1919-1920, on the artificial drying of hay, experimented with:—

(*a*) Unheated air blast,
(*b*) Heated air blast,

in one case the air being heated electrically and in the other by the burning of hedge trimmings. The ricks were built on wooden structures.

I, with other of his friends, witnessed these experiments and noticed that green, rain-saturated grass was being used.

Mr. W. W. Hood made a great point of drying the hay equably to prevent it becoming scorched or mouldy, which caused him to pay great attention to the position and dimensions of the air ducts under and through the stack, and from his lifelong experience as a mining engineer of great repute in South Wales in the control and management of ventilation, where he would be dealing with hundreds of thousands of cubic feet of air per minute, taking hundreds of horse-power to produce, through miles of underground roads and by-ways of collieries. I know that the problem of dealing with the small amount of air taking a couple of horse-power to dry a stack was easily solved by him.

The bacteriological aspect of hay-drying, he told me, was extremely important and most interesting. I also know that an artificially dried stack he showed me in 1922 at his Tredean estate, Chepstow, gave him great pleasure in being perfectly dried and in perfect condition.

I think that Mr. W. W. Hood successfully solved the problem before Mr. B. J. Owen commenced it.

C. T. Allan,
Assistant Manager,
SOUTH WALES E.P.D. Co.

Cardiff, *November 26th*, 1924.

The Moderate Powered Direct-coupled Back-geared Motor.

We read with interest the article on the above in your issue of November 7th, but we are surprised at the writer's condemnation of ball and roller bearings on gear drives. We have supplied many scores of roller-bearing machines for use with gears, and always with entire satisfaction. The assumption that a roller bearing will not stand any vibration is quite incorrect, as our experience with gear drives in mines and steel works makes us confident that a roller bearing is infinitely superior to any oil ring bearing, always provided that the roller bearing is of proper size, and is correctly mounted.

The Lancashire Dynamo & Motor Co., Ltd.
A. P. WOOD, *Managing Director*.

Manchester, *November 25th*, 1924.

The Illumination of Large External Areas.

I was interested in the article by Mr. Leslie G. Toplis in your issue of November 21st, and would like to make the following observations:—

(1) The effective illumination of external areas on an economic basis *has* been solved, and it is not the insoluble problem which Mr. Toplis seems to think it is.

(2) The idea mentioned by Mr. Toplis is not new, as an improved form of lantern with multiple projecting lenses and mirrors has already been adopted by many large collieries, steel and iron works, docks, and tramways throughout this country.

(3) Mr. Toplis did not refer to the advantage gained by projecting light with lanterns using gas-filled lamps and multiple projecting lenses and mirrors, or similar, into chemically laden atmospheres, by this means eliminating interior wiring, but this is a problem which has had to be met, and it is of so much consequence that I thought it best to mention it. This has been accomplished, and large buildings are being lit internally, by lanterns fixed externally, at one of the largest chemical works in the world.

(4) Whilst the arc crater has undoubtedly high intrinsic brilliancy, its many disadvantages make it a failure for general industrial purposes.

(5) Standard gasfilled lamps (of any make) have high intrinsic brilliancy, and these are now being successfully employed for the conditions mentioned by Mr. Toplis, in lanterns which cover the following, and which possess features which are improvements on the arc projector fitted with a large parabolic reflector, suggested by Mr. Toplis.

Instead of a separate reflecting surface placed at some distance from the light source, a lantern is employed, of quite reasonable dimensions, which contains a standard gasfilled lamp. Around the lamp itself, inside the lantern, a number of high-grade lenses, correctly in focus with the filament, project beams of light on to separate *adjustable* mirrors, which reflect these beams at different angles, or they can be superimposed. The mirrors are either of plain or diffusing type.

It is quite easy to illuminate horizontally or semi-horizontally, dumps, ships' holds, railway and colliery sidings, large outside signs, large open spaces and squares, involved tramway overhead crossings, vast constructional works such as dams, &c., quays and jetties, iron furnaces, road and street constructional works (as well as power and turbo houses, rolling mills and foundries internally) with these lanterns, and all the above are actually being illuminated by the lanterns referred to.

If Mr. Toplis will communicate with me, I shall be pleased to give him further details, which perhaps it would be best not to mention in these columns.

Harry E. Johnson.

November 27th, 1924.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1923.

16,846. "Receiving apparatus for alternating and direct current, and wireless telegraphy, and the like." Siemens & Halske Akt. Ges. January 23rd, 1923. (210,389.)

18,903. "Electric furnaces or the like." L. W. Wild, E. P. Barfield, and J. P. D. Coleman. February 12th, 1924. (224,272.)

19,878. "Electric cables." British Insulated & Helsby Cables, Ltd., J. L. Packer, and C. Vernier. August 3rd, 1923. (224,278.)

19,935. "Submarine telegraph systems." Western Electric Co., Ltd. (Western Electric Co. Inc.). August 3rd, 1923. (224,280.)

19,968. "Electric resistance welding." C. A. Hadley and Rose Street Foundry & Engineering Co., Ltd. August 3rd, 1923. (224,282.)

20,292. "Construction of grid leak for wireless telegraphy and telephony." R. Woods and W. H. Le Breton. August 9th, 1923. (224,295.)

20,484. "Magnetic brakes." F. B. Holt and Metropolitan-Vickers Electrical Co., Ltd. August 11th, 1923. (224,303.)

20,501. "Sound reproducing devices." S. Calamatianos. August 11th, 1923. (Addition to 211,826.) (224,304.)

20,665. "Telephone systems." Coventry Automatic Telephones, Ltd., and J. E. Collyer. August 14th, 1923. (224,308.)

20,725. "Electrolytic rectifiers for alternating currents." R. F. Bossini. August 15th, 1923. (224,309.)

21,251. "Wireless control apparatus." Vickers, Ltd., and C. P. Ryan. August 22nd, 1923. (224,318.)

21,312. "Electromagnetic firing mechanism for guns." H. G. A. Scott. August 23rd, 1923. (224,319.)

21,501. "Electrical heating systems for buildings." R. Grierson and Grierson, Ltd. August 24th, 1923. (224,321.)

21,557. "Apparatus adapted to operate as an electric generator and an engine-starting device." L. Lanquetin. August 25th, 1923. (224,322.)

21,647. "Control of electric motors." Clarke, Chapman & Co., Ltd., and R. C. Harris. August 27th, 1923. (224,325.)

21,838. "Tramway vehicles." Brush Electrical Engineering Co., Ltd., and W. E. Hall. August 29th, 1923. (224,030.)

21,910. "Electrodes and their method of manufacture." Chile Exploration Co. March 16th, 1923. (212,871.)

23,000. "Electrical discharge devices." British Thomson-Houston Co., Ltd. (General Electric Co.). September 13th, 1923. (224,335.)

23,170. "Time-pieces or master-clocks influenced by electric waves or impulses for electrically-operating secondary clocks." F. Schneider. September 15th, 1923. (224,337.)

25,442. "Electromechanical starting and stopping device primarily designed for actuating photographic shutters, but applicable also for actuating other devices." C. G. Lowen, C. P. Lingwood, and Pictorial Machinery, Ltd. October 12th, 1923. (Addition to 208,773.) (224,354.)

26,957. "Electrical plug connections for wireless receiving sets and other purposes." H. C. Linzell. October 27th, 1923. (Cognate application 1,690/24.) (224,366.)

27,063. "Loud-speakers for wireless telephonic installations." Johnson and Phillips, Ltd., and W. H. Johnson. October 29th, 1923. (224,369.)

28,592. "Telephone exchange systems." Coventry Automatic Telephones, Ltd. (R. C. Arter). November 13th, 1923. (224,383.)

28,999. "Means for disinfecting the mouthpieces of telephone transmitters." S. Lash. November 16th, 1923. (224,384.)

30,084. "Electrical switchgear." H. Beardall and Metropolitan-Vickers Electrical Co., Ltd. November 29th, 1923. (224,388.)

30,187. "Selective and anti-parasitic receiving systems for electromagnetic waves and electric currents of constant frequency." Marrec, Ltd., and Y. Marrec. November 30th, 1923. (Addition to 212,177.) (224,389.)

31,666. "Electric clocks." B. Newth and O. Newth. December 19th, 1922. (208,706.)

31,813. "Method of and means for controlling electrically-driven hauling and hoisting engines." G. W. Bousfield and D. Ashton & Co., Ltd. December 19th, 1923. (224,397.)

1924.

3,148. "Telephone systems." Siemens & Halske Akt. Ges. March 19th, 1923. (213,227.)

4,135. "Method of and means for bonding metal-sheathed electric wires and cables." C. W. Bloomfield. February 19th, 1924. (224,430.)

5,240. "Insulated conductors." British Thomson-Houston Co., Ltd. March 2nd, 1923. (212,266.)

5,941. "Adjusting means for inductance coils and the like." Aktiebolaget Baltic. February 19th, 1924. (224,442.)

11,624. "Radio-receiving systems." British Thomson-Houston Co., Ltd. May 11th, 1923. (Addition to 187,986.) (215,787.)

12,495. "Control of the conditions of operation of electric motor-generator sets." E. I. David. May 21st, 1924. (Addition to 215,839.) (224,470.)

12,711. "Alternating-current polyphase transformers." British Thomson-Houston Co., Ltd. May 28th, 1923. (216,867.)

13,807. "Directional reception and transmission in wireless telegraphy." M. Latour. June 5th, 1923. (217,238.)

14,069. "Illuminated advertisements." A. Wuillemin. June 11th 1923. (Addition to 182,794.) (217,587.)